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Diseases of Fur Bearing Animals

Edited by Edwin J. Frick

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PROFESSOR EDWIN J. FRICK

Doctor Frick, editor of this special issue of VETERINARY MEDICINE on the "Diseases of Fur Bearing Animals," is well qualified for the task by training and experience. His work as Director of Clinics and Head of the Department of Surgery and Medicine of the Veterinary Division of the Kansas State College, together with his position of vice-president of the Franzhurst Rainbow Trout Company, owner of a group of fur farms and trout hatcheries in the Pike's Peak region of Colorado, has given him wide contacts of a practical nature with the fur industry. Doctor Frick is also a collaborator in the Bureau of Biological Survey and some time ago gave a series of radio broadcasts on Wild Life Conservation. All this has given him a wide acquaintance among game breeders, fur farmers, fur magazines and the fur industry generally, and important opportunities to apply the principles of scientific veterinary medicine to the problems of fish and fur production—to the wild and the semi-wild animal life.

Doctor Frick was born and reared in the heart of New York City. The first money he earned as a boy was spent for a correspondence course in taxidermy—indicating a strange ambition to be nurtured "on the sidewalks of New York." Transferring from the New York State College of Agriculture to the New York State Veterinary College at Cornell University, he was graduated from the latter in 1918 and immediately enlisted in the army aviation service, but was later transferred to the Veterinary Corps. After the war, he was employed on the veterinary staff of the New York Women's League for Animals and came under the tutelage of the Blair brothers, Wm. Reid and Bruce. He has never quite lived down this portion of his career; by many is still regarded as a specialist in the diseases of pets. However, of recent years Doctor Frick has appeared on the programs of veterinary meetings in many states to discuss problems dealing with diseases and surgery of farm animals. Since 1919, he has been with the Kansas school.

VETERINARY MEDICINE is deeply obligated to Doctor Frick and the corps of excellent collaborators who have presented in this issue what is undoubtedly the most uptodate, the most authoritative and the most comprehensive, thoroughly scientific discussion of this subject available to American veterinarians.

Because publication of this special issue was advanced from January to December, several excellent manuscripts, prepared for it, were received too late for inclusion. They will appear in a subsequent number and complete the discussion.—D. M. C.

The Fur Industry

By E. J. FRICK, Manhattan, Kansas
Division of Veterinary Medicine, Kansas State College

The development of this country in its earlier days was due in no small measure to the quest for furs. The early trapper and trader were among the first of the pioneers and it was due to their activities that a large part of this country was first explored and developed.

Today the quest for furs is still a pioneering adventure. For the past several years the United States and Alaska have been producing approximately $60,000,000 worth of pelts annually. This is greater than Canada's $18,000,000 and Soviet Russia's $35,000,000 combined. The United States produces more raw fur than any other country in the world.

The fur industry is no small business. Our entire country is ideally adapted for raising the various fur bearers. About 30,000,000 fur bearing animals are killed annually in the United States to meet the demand for furs. In some sections, animals such as the skunk and muskrat are found in large numbers. Even the agricultural state of Iowa last year produced $615,000 worth of fur, of which approximately $200,000 was received for muskrat fur and $96,000 for skunk fur. New York and Pennsylvania each produced $2,000,000 worth in 1935. Louisiana alone produces four to six million muskrat pelts a year, in spite of the fact that trapping has been engaged in for 200 years in some sections.

This country uses more fur than any other in the world. The demand for furs exceeds the natural supply so it is necessary to attempt to raise it as other livestock is produced. Proper protective legislation for wild fur bearers and the raising of fur bearers in captivity seems the best methods of increasing our fur resources. It is perfectly obvious how proper laws preventing the taking of unprime fur or killing animals during the breeding season would help preserve our wild fur bearers.

A good example of this is the fur seal off the Pribilof Islands of Alaska. In the middle of the last century there were at least four million fur seals. Approximately 80% of the fur seals in the world inhabit our Alaskan waters. Ruthless destruction of these animals by man brought their number down to 130,000 head by 1910. In 1911 an international sealing agreement between Japan, Canada, Russia, and the United States was entered into. The United States agreed to protect these seals and each country was to be given 15% of the pelt price of any seals destroyed. Under this agreement the sealing herds have been improved and increased to over a million head at the present time.

Veterinary supervision of the Alaska fur seals was called into play when mange was found to be causing heavy loss in pelt value. Oil covering the basking rocks brought this condition under control. In the 69 years that the United States has owned Alaska, her seal industry has returned her $63,000,000 or nine times the purchase price of Alaska. This is an excellent illustration of how intelligent protection of wild fur bearing animals pays big dividends.

One of the most beautiful furs in the world, and also the most durable is, that of the sea otter. It is at present almost extinct and needs proper protection to survive.

The raising of fur animals in captivity, the other alternative, has recently developed rapidly. Today fur farming represents a business of $50,000,000 in the United States and it is steadily growing. There are over 3,000 fur farmers in the United States and about 1,500 in Canada. This industry, practically non-existent at the turn of the century, now supplies 20% of the raw furs on the markets and at least 98% of the silver fox pelts. Aside from fox some of the common species of fur bearers raised are: Fitch, South American nutria, muskrat, beaver, fisher, moun-

tain lion, mink, marten, raccoon, opossum, badger, skunk, chinchilla, otter, and Karakul sheep. The last name being the animal from which we get Persian lamb and Astrachan also called "black rose fur." The raising of any one of these animals is a business in itself and most of them have interesting romantic histories. The veterinarian who studies these backgrounds will not find his time wasted.

There are two principal breeds of fox, the white fox of which the blue fox is a color phase, and the red fox of which the silver, black, and cross fox are color phases. Because of the color phases especially the silvers were so exceedingly rare in the wild state they brought fabulous prices. In 1883 Charles Dalton at Prince Edwards Island and at about the same time Mr. Morrison in Alaska dug out a litter of black fox pups and started to raise them. A female silver fox captured in the wilds in 1913 brought $10,000. An industry was well established. One group, Fromm and Neiman of Hamburg, Wisconsin, in 1929, pelted 8,000 foxes and received a check for $1,331,679.35. The fur breeders have had plenty of difficulties pioneering their husbandry—not one of the least of which was the fleecing of the general public by promoters who would buy a few scrub animals and sell stock in their "farm" at an outrageous valuation. Fur farming is a specialized industry. Foxes are highly tempermental—a nervous vixen if alarmed—often kills her pups. That is why good fox farmers do not allow visitors around their pens in the spring. Foxes are monogamous and usually mate in January or February with a gestation period of 52 days and an average of three to five offspring. A mixed diet of eggs, tomatoes, horse meat or beef, chicken heads, fish, boiled vegetables, carrots, etc. constitutes their feed. In the fall, fox shows, similar to other live stock shows are held. When the non-breeding surplus fox pelts reach their highest quality of perfection they are called prime and are killed or "pelted." In 1927, 40,000 fox pelts were sold at an average price of $123.33, in 1935, 200,000 pelts averaged $45.00; i. e., last year's crop brought $8,000,000.* This is a healthy trend from all standpoints, especially as the fox farmers are still making money.

The trade name of many of the common furs is interesting. How many when paying for a fur coat of "Alaskan sable" or "black marten" realize that it is a common Kansas skunk? Rabbit fur dyed and sheared is paraded under such titles as "electric beaver," "coast seal," "bay seal," "beaverette," "baltic leopard," "Baffin seal," "Belgium beaver," "French seal," "French beaver," "French leopard," "Roman seal," or "polo seal." What is in a name? Our common muskrat masquerades under the name of "Hudson seal," "river sable" and "water mink." A real lamb in wolf's clothing is exemplified when you buy "French wolf" which is a straight-hair, processed lamb or call it "Iceland fox" if you like. If it is raccoon dyed it may be called "lacoon" or "lykoon." Sheared goat with stenciled spots you pay for as "leopard" or without the spots it becomes "China bear." The fur names remind me of the man who was always getting things backwards particularly when he claimed to be the best lamb dyer in the state. Better furriers are trying to correct this misleading nomenclature and the Federal Government is trying to stamp out racketeering in the fur trade.

The general public is becoming more fur conscious and in fact we even have the first week in November designated as National Fur Week. Furs are necessary for warmth and they are flattering for dress purposes.

Pedigrees are kept of most fur breeders and scientific knowledge of the law of inheritance are being used to improve the size, color and quality. Every animal is tattooed in the ear and complete careful records kept. Advances of greatly increased size of mink, pure, black raccoon, platinum colored skunk have already forecast a future change in fur naturals. As fur farming becomes more extensive it will enable many farmers to engage in it as a side line and it will return a profit on some submarginal land and place the cost of furs down where the common people can in-

* Most figures taken from January, 1936, *Fortune*.

dulge in what, at the present time, is a luxury.

The fur raising industry is big business and it behooves every practicing veterinarian to become interested, since there is a breeder somewhere near him who needs service that only a graduate veterinarian can intelligently render.

* * * *

EARLY SILVER FOX HISTORY

Probably the first record of raising silver foxes is that of John Hadley of Wellington County, Ontario, who in 1860 raised a pair from wild stock. The venture was not successful, however, and for a period of over 20 years there is no record of an attempt to domesticate a silver fox.

The present silver fox industry was started in the Eighties and controlled for many years by a small group of men in Canada. They captured and domesticated their own wild stock. Until 1910 they kept an agreement among themselves that they would sell no breeding stock to outsiders. At this time such high prices were offered for their stock that the agreement was broken and fox ranching began to spread slowly at first throughout Canada and the United States. A single pair of silver foxes sold for $16,000 in 1913.

In 1883 Sir Charles Dalton bought a pair of wild dark foxes on Prince Edward Island. He managed to raise a litter from them the second year that became the foundation stock of that now famous strain. Dalton set up his own standards and pelted all foxes which did not reach it. Two years later, he bought from Louis Holland on the island two pairs of black foxes and three red foxes. It is not known whether he crossed the two or not. After two successful years Dalton's foxes failed to produce young and he decided that they must be raised under more natural conditions. He then took Mr. Robert Oulton in as a partner and the two started a ranch on Cherry Island, giving each pair 2500 square-feet of ground space. From this time on they were very successful and this size yard is still used on many large ranches today.

In 1900, the partners sold a pair of foxes to Messrs. Robert Tuplin and James Gordon. This pair became the foundation stock of the Tuplin strain. The only outside blood added was a young black male captured on the island. The first pelt sold from this strain brought $1800 on the London market.

Although most of the early fox raising centered on Prince Edward Island other pioneers were busy elsewhere. In 1898 Johann Beitz of Piastre Bay, Quebec, brought some black foxes from Alaska and had some success raising them. T. L. Burrowman is credited with raising foxes for twenty years in Wyoming, Ontario. Other pioneers in Ontario were R. E. Hamilton and G. W. and B. J. Gillis.

The pure Canadian fox, which is a distinct type, had its origin in a wild silver female caught in Northern Alberta. This fox was purchased for $10,000 and mated with a Dalton-Oulton black male.

About the same time in Alaska, George Morrison bought three black fox pups from an Indian. One pup died and the other two produced a litter of six the following year. With these he started a ranch, unaware that foxes were being domesticated by other men. He met J. E. Milligan, a native of Prince Edward Island. They obtained more wild stock, formed a partnership and moved all of their stock to the island. These foxes were the foundation stock of their strain of Alaskan ranch-bred foxes.

In this way, from a few pairs of wild foxes, was built up an industry which now pelts 160,000 animals each year.

In the meantime the range of hunters and trappers has been extended to the most remote and formerly inaccessible regions. Railroad, steamship and airlines have invaded the uttermost sanctuaries of wild life. Canned food, better camping equipment, modern firearms, improved traps and more alluring baits and scents are enabling hunters to slowly drive to extinction many of the wild fur bearers.

Abstracted from "Theory and Practice of Fox Ranching." By Allen and McLure.

C. W. Bayles, K.S.C., '37,.
Manhattan, Kans.

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Feeding Foxes on Fromm Brothers' Ranch.

The Field of Veterinary Service to Fur Farmers

Fur husbandry is new in this country and as yet veterinary curricula have not included a course in diseases of fur-bearing animals. Possibly it is for this reason that the experience of the average rancher with his veterinarian has been a disappointment, principally I think because these animals, still wild, do not give very much of a clinical picture upon which to base diagnosis.

With each successive generation of domesticity, disease constitutes an increased hazard to fur bearers. At the start it was the belief of ranchers that disease was in no way a problem in the productions of raw furs but they found quite the contrary to be the case; epizootics being very prevalent.

A great deal of investigational work is being carried on by research and scientific agencies in an attempt to solve these problems but as yet without a great deal of success. The knowledge we have gained of fox diseases is so vague and little is known of the etiology, symptomatology, and pathology of the various troubles that go to make up disease in foxes and biological control is not as yet available to veterinarians. However, if solved, it should bring the veterinarians very closely into this picture and with each succeeding year his field will be enlarged. Investigational work is being carried on through the efforts of the American National Fox and Fur Breeders Association.

In the meantime the veterinarian can be of the greatest service, in a field open to him for entry right now, in the matter of sanitation. Sanitation is of first importance in the proper management of a ranch. The aim of the rancher should be not so much to discover a means of treating a disease, but rather by constant vigilance to maintain effective ways of preventing disease. When called in by fur ranchers the veterinarians should attempt to inform the ranchers how important sanitation is on a ranch.

At the present time disease is very prevalent in ranches throughout the country. Once definite knowledge of the etiology of such diseases is developed the field of veterinary service will be large.

L. J. O'Reilley, M.D.C., President
American National Fox &
Fur Breeders Ass'n
Wausau, Wisconsin.

What Fur Breeders Expect of the Veterinarian

By HARRY J. LA DUE, Duluth, Minnesota
Editor—American Fur Breeder

THE first silver fox ranch in the United States was established in 1910. Only twenty-six years ago and yet, in that short space of time, the fur breeding industry has grown to such proportions that it is estimated that over $50,000.000 are now invested in fur ranches in this country.

Those of us who have been connected with the industry for the past 20 years know that it has had a normal development; but to many its growth has probably seemed sporadic. I believe the veterinary profession shares in this belief and I doubt whether 10% of the 9000 practising veterinarians of the United States have had any contact with the fur breeding industry or are acquainted with its history and development.

Fur ranches, engaged principally in breeding silver fox and mink, are scattered from coast to coast, operating in nearly every state offering suitable climatic conditions for the production of fur. Most of these ranches are operated by practical, successful breeders. The industry is well organized. Authentic herd records are kept and breed improvement is maintained through educational meetings and live animal and pelt shows. A percentage of the pelt crop is marketed through central marketing organizations, maintaining receiving warehouses and auction sales outlets and one large fur farm company has recently established a successful auction on its ranch.

Some states boast of 500 or more fur farms. One state produces over 80,000 silver fox pups annually. The mink breeders in another state produce over 25,000 mink kits. Fur ranches in the United States produce approximately 175,000 silver fox pelts and 80,000 mink pelts annually. Over 100,000 pairs of breeding foxes and 35,000 breeding mink are required to maintain this production.

HERE is an animal industry that merits the attention of every veterinarian. Many veterinarians are specialists, it is true, but I believe the rank and file are general practitioners and as such are skilled in small animal practise. The fur breeding industry, being widely distributed, offers a lucrative field for a large number of these men and the application of many trained minds to our problems would likewise be of inestimable help to our industry.

While the average veterinarian may have had little or no experience with the semi-wild carnivora, still he has had a thorough training in animal diseases and treatment and his general knowledge can be easily and intelligently applied to fur-bearing animal health problems.

In this connection it is significant to note that some of the most successful fur breeders in the United States are veterinarians. In fact, much of our progress in fur animal husbandry is due to the knowledge and efforts of these and other veterinarians and bacteriologists engaged in government and state service.

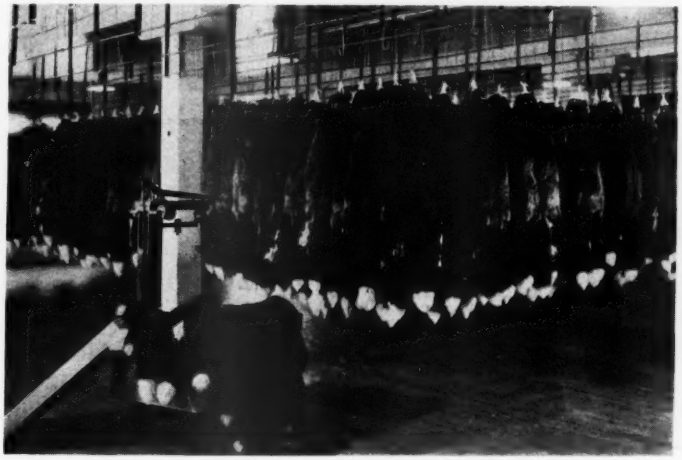
From the standpoint of handling and of diagnosis and treatment of disease the ranch-bred silver fox or mink is still a wild animal. They seldom become wholly tame and usually dislike the touch of the human hand. However, veterinarians treat house cats and I doubt whether any animal will exhibit more fierceness or savagery than a cat under restraint. Fur breeders have developed a technique in bare-handling their animals which precludes the possibility of injury to themselves and makes it possible to treat them for parasites, both internal and external. Complete control can be had through the aid of mechanical holding devices, several of which are on the market.

THE health problems of fur-bearing animals in captivity are no more mysterious than the problems confronting the breeders of the usual farm or other domestic animals. The latter are more docile and tractable, that's all. Fur-bearing animals are naturally furtive and it is not always easy to determine when they are ailing.

They are subject to all the ills and ailments of any animal. In confinement they suffer from malnutrition, infectious diseases, parasites, insanitary surroundings and accidents. Malnutrition comes first because improper feeding and faulty diets are usually a prelude to loss of disease resistance. The most baffling diseases on a fur ranch—the diseases that cause the heaviest losses are epizootic in nature. Considerable research work in the field of epizootic diseases in captive fur-bearing animals has been done but progress has been slow, very much remains to be done, the field is wide open for further research by bacteriologists and veterinarians.

Foxes and mink are subject to invasions of nearly all of the internal and external parasites that beset carnivorous and omnivorous animals. Most of them are being successfully combated with parasiticides but there is still room for considerable research in this field. We need more information about the life histories of parasites and about the vulnerable links or stages in these life histories.

Insanitary surroundings on the fur ranch are, of course, the result of carelessness, indifference or lack of information. Many breeders would profit from the advice of veterinarians if the latter were employed to inspect their animal quarters occasionally. Accidents are rare on the well-ordered ranch, but broken limbs and bad flesh wounds can usually be treated effectively by the same means the veterinarian employs in treating domesticated carnivora.



Pelts in the fur house of Nieman Ranches.

THERE are many unsolved problems in fur farming. The solution of these would be greatly accelerated if veterinarians throughout the country were in closer contact with our industry. The trained mind of the veterinarian and his knowledge of animal physiology would be of inestimable help in solving these problems.

Greater knowledge of nutrition and the inheritance of animal characteristics would furnish the key to the solution of many of these problems. Captive fur animals have been summarily taken from the wild, deprived of natural foods and abruptly forced to subsist on artificial foods. Thanks to present day knowledge of the chemistry of foods captive fur-bearers have done surprisingly well on artificial rations. But there is much experimenting yet to be done.

The production of young, maintenance of health and normal growth and development of body and fur depends on proper nutrition. Ranch production still falls far short of normal production in the wild. By the same token our artificial rations must still lack certain nutritive substances which are present in the natural foods of wild fur-bearers.

Fur animals show the effects of malnutrition quickly. If the diet is deficient the animals become unthrifty, normal matings will not take place, the young die in utero, females will have difficulty at parturition or are unable to nourish the young properly. Adult animals, improperly fed, will not go through a normal fur priming cycle, their fur will be off-color and shaggy in appearance and eventually they succumb to some infectious disease.

The secrets of the physiology of breeding of fur-bearing animals are still largely a closed book to fur breeders. Some knowledge of the varying food requirements of foxes and mink during the seasonal phases of their physiological cycle has been acquired but there is great need for more scientific research in this field.

Thus far only a smattering of the true facts concerning the inheritance of the physical characteristics of our animals has been acquired. We are primarily concerned with the production of commercially valuable fur of clear color, luxuriant growth and soft texture. If we hope to improve our breeding animals we must start to work on our genetic problems.

THE foregoing are only a few of the enigmas fur breeders are constantly coping with. They will welcome the professional and scientific advice of veterinarians. However, it is up to the veterinary profession to prove that it can help. The first step should be the inclusion of fur-bearing animal courses in the curriculum of veterinary colleges. There are fur ranches in the vicinity of nearly every college and it would be an easy matter to secure specimens and make contact with ranchers.

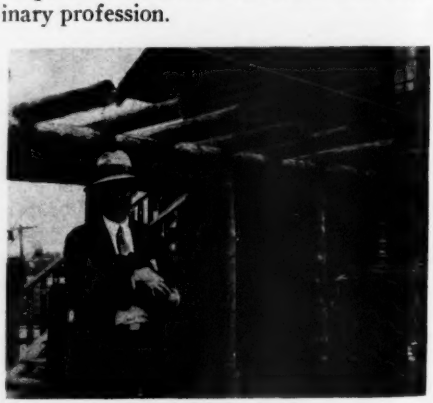
Practising veterinarians can likewise make contact with ranchers and gain valuable, first hand information. The technique of handling the animals can be acquired in this way and any number of animal carcasses can be obtained at pelting time for anatomical and physiological and pathological studies.

It is also possible to develop a service for the periodical examination of fur animals, food supplies and housing conditions. The health of these animals can often be determined by the periodical examination of fecal droppings, and nasal and vaginal smears.

VETERINARIANS should never fail to attend a fur breeder's meeting, school or show. To listen to the recitals of experiences by breeders is an education in itself.

Every ranch should be looked upon as a potential experimental laboratory. Veterinarians should call on ranchers and suggest practical experiments and collaborate with the rancher in carrying them out and in reporting them to the ranchers of the country through the fur trade publications.

The fur farming industry has grown up like Topsy. Fur breeders have to a large extent worked out their own problems. Many of them show a high proficiency in handling and caring for their animals. Nevertheless, disease continues to take a heavy toll and if there is any truth in the adage that "an ounce of prevention is worth a pound of cure" I believe fur breeders will welcome a closer contact and better coöperation with the members of the veterinary profession.



Doctor Frick finds a tame one.

Post Mortem Technic and Observations

By R. C. KLUSSENDORF,
Madison, Wisconsin

WHEN an autopsy is to be performed the operator should remember always that it may be desirable to send specimens to a laboratory. It is not to be inferred that every autopsy performed will necessitate or even warrant the sending of specimens to a laboratory, but a business-like autopsy can be performed just as readily as a "sloppy" one. Many autopsies are performed to substantiate ante-mortem diagnosis, and when the diagnosis has been correct there may be no reason for a complete autopsy. However, there are occasions when post-mortem findings do not verify ante-mortem expectations, and cases of this type may justify sending tissues to a laboratory for additional study.

External Examination

To make a neat and orderly post-mortem examination of a fox or other small animal place the carcass upon its back. If the fur is still on, examine for external parasites. These are relatively unimportant, but their presence should be noted.

Fleas are found more or less regularly, and may be as numerous as they are on some dogs. They are seldom present in significant numbers on animals from ranches that are cleaned regularly during the months when fleas multiply rapidly.

Lice are rarely found, and are not at all likely to be a factor in fox health.

Mange is also rare, but when it has established itself it may be extensive. It is difficult to combat because foxes do not stand dipping at all well, and this is the only effective method of combating mange.

Ear mange is present on many fox farms, and when present it is found in a large percentage of the animals on the ranch. Occasionally convulsions are caused by heavy infestations of ear mites, so that a history of convulsions should always suggest examination of the ear.

Internal Examination

When this brief external examination has been completed place the carcass on its back with the head away from the operator or to the left. Make an incision through the skin on the median line from the throat to the anus. Make a lateral incision for each leg. Lay the skin back, fur side down, breaking down the subcutaneous tissue sufficiently to permit the pelt to lie flat on the autopsy table. Unless this precaution is observed it is highly probable that the results will be comparable with those secured by the fox rancher who complained that "When I get a fox opened up it is just a mess of fur and guts."

Most specimens presented for autopsy will have been pelted, and this greatly facilitates the examination. With the carcass still on its back dismember the front legs, or cut enough of the muscles so that the legs act as braces to hold the carcass upright. In making similar braces of the rear legs it will be necessary to open the coxofemoral joint in order to lay the legs out flat.

Make an incision through the floor of the abdomen at the sternum. Insert two fingers, pull the muscles away from the organs, and extend the incision to the pelvis by cutting between the fingers which slide backward as the incision lengthens. Make a lateral incision on each side following the cartilage and the last rib, and permit the muscular tissue to drop out of the way.

Get a general view of the position, relative size, and condition of the several peritoneal organs; but handle the tissues no more than is necessary to observe all of the organs. If any of the organs are abnormal the nature and extent of the pathological changes should be noted.

Raise the omentum and trim it away from the stomach, using either a scalpel or a small pair of scissors. Gather the in-

testines in the left hand, raise them, and sever the mesenteric vessels and the mesocolon by which they are attached to the sublumbar region. Grasp the esophagus just anterior to the stomach, and holding this firmly between the thumb and index finger of the left hand sever the esophagus at the diaphragm. Raise the left hand and lay the stomach and intestines outside the body cavity. Place two fingers of the left hand under the liver and sever it from the diaphragm and its attachments. Remove the kidneys in a similar manner, and place them beside the other organs.

Incise the diaphragm around its margin, exposing the organs of the thoracic cavity. With a pair of bone shears cut the ribs on either side—near the vertebrae—and lay them forward. Grasp the trachea, esophagus, and vessels anterior to the heart, sever them, and draw out the heart and lungs—tearing the mediastinum.

Now a detailed examination of each organ can be made without disturbing any other part of the carcass. With a pair of scissors or a small enterotome open the heart and examine the external surface, the heart muscle, the endocardium, and the valves. Diagnostic lesions are not likely to be encountered here, but should always be sought.

Lungs.—With an enterotome open the lungs from the trachea down through the bronchi and bronchioles. Note any congestion, pneumonia, the presence of lungworms, and any other abnormal condition. Lungworms are unquestionably the most important internal parasite of foxes. They inhabit the smaller bronchioles. They produce a prolonged disease characterized by chronic inflammation of the trachea, bronchi and bronchioles. Atelactasis and emphysema alternate, giving the lung a mottled appearance not typically pneumonic. Lungworms can be seen readily as tiny thread-like parasites in the bronchial exudate expressed from the lung, and eggs will be found in great abundance when this exudate is examined under the microscope.

Stomach.—Next open the stomach and determine the amount, the quality, and the condition of its contents. Make a note of any inflammation of the mucosa, or of other pathological changes present. Determine whether the inflammation is due to parasites or to other causes.

Perforating gastric ulcers with gross leakage of the stomach contents to the peritoneal cavity may be noted. Sometimes gastric rupture results without apparent predisposing tissue changes. Overeating and excitement after feeding lead to troubles of this type.

Intestines.—Open the intestines from the pylorus to the anus, and note any abnormalities. Acute inflammations are likely to be the result of dietary disturbance, although massive infestation with certain of the intestinal parasites may cause severe inflammation also.

The intestinal parasites likely to be encountered are numerous, because the fox and other fur-bearing animals are really wild animals, and when closely confined in small cages they encounter many parasites against which they have developed no protective forces.

Ascarids are so common that routine treatment is usual on fox ranches. The most harmful effects are noted when the fox is two to four weeks of age. Heavily infested pups grow slowly, are often emaciated and pot-bellied, and are subject to digestive disorders. When ascarids are present they will be found in the duodenum, and they may migrate to other parts of the digestive tract—either forward to the stomach, or to any part of the posterior bowel. They may be present in sufficient numbers to provide mechanical interference with digestion.

Hookworms are probably present on all fox farms. They do most of their damage in pups three to six months of age. When present in large numbers they produce a severe inflammation of the small intestine, which is associated clinically with diarrhea and bloody stools. Usually hookworms may be seen plainly on the intestinal mucosa, and may be studied more closely under the microscope.

Coccidia may be found in practically all foxes at some time between the second

and the fifth month. On opening the intestine it is well to make scrapings from several sections, selecting inflamed areas if any are present. Place this material on a microscopic slide, put on a cover glass, and examine under the scope. When coccidia are present in sufficient numbers to be important they will be seen readily under the low power. Some doubt exists as to the effect coccidia have on the intestinal wall. Sometimes the mucosa will be bright red in color and oozing blood, while at other times there may be only a slight catarrhal exudate and a comparatively harmless-looking thickening of the mucosa—and coccidia will be equally abundant in both cases.

Other parasites that may be encountered but are not likely to be an important factor in making a diagnosis are tapeworms, whipworms, threadworms of the bladder and flukes.

Paratyphoid infection may be encountered when sanitary precautions are not carefully followed. Acute inflammation of the digestive tract, or parts thereof, lead to a suspicion of this condition when parasites are absent. This is more likely to occur in young animals, and may be manifested before death by marked weakness, sunken eyes with a purulent discharge, and occasional convulsions. Losses may be sporadic or may run as high as 50%. Usually the marked enteritis is associated with a spleen that is enlarged and dark. The bacteria can be isolated from such a spleen and an autogenous vaccine prepared.

Brain.—To examine the brain use bone shears to cut to the right and to the left of the foramen magnum, following the base of the skull. Examine the meninges, and then incise these longitudinally and lift out the brain with the fingers.

Fox encephalitis may produce no organic change recognizable on gross examination. Sometimes there is gross hemorrhage in the brain and spinal cord, but this finding is by no means constant. More often there is hemorrhage in the pancreas, stomach, intestine, thymus, or supra-renal glands, or in the submaxillary lymph glands. Microscopic changes in the nervous tissue are reported by investigators, but are hard to find in routine laboratory specimens.

Fox Distemper

Fox distemper frequently takes in everything that the fox rancher does not recognize as any other disease, and it will be difficult to substantiate on autopsy a diagnosis of this condition as made by the rancher. The term is being used so loosely that a diagnosis of fox distemper has little value, and it would be better to diagnose respiratory or digestive disturbance and treat symptomatically than to fall back on fox distemper and have the rancher try any or all 'pet' remedies for that condition. Extensive inflammation of the mucous membranes are characteristic of distemper, but secondary infections often change the picture practically beyond recognition. Sometimes the respiratory mucosa is the seat of most trouble and should receive most attention when treatment is undertaken. At other times, or on other ranches, the intestinal mucosa is severely damaged while the respiratory tract remains practically normal.

Prevention More Important Than Cure

While not strictly within the province of this paper, there is a strong temptation to say a few words about the use to be made of information gained from a post-mortem examination. In the fur-bearing animals a considerable portion of the trouble encountered is due to parasites and to dietary or digestive disturbance. Much of the trouble of this nature can be controlled by outlining a thorough sanitary procedure and the well-informed veterinarian will stress this point while administering symptomatic treatment. Conversely, to furnish treatments to 'cure' every ailment without regard to proper sanitation may lead the thinking client to classify such procedure along with the patent nostrum business and to classify the guilty veterinarian as a poorly informed individual. It is much better to diagnose the pathological changes present and to treat accordingly, than to conclude that all of these changes represent some certain disease and then treat the disease without regard to the particular findings typical of that ranch.

Restraint and Medication of Foxes

By A. A. KINGSCOTE, Guelph, Canada
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To the novice the handling of foxes appears to present many difficulties yet in reality they are the most easily handled animals. The purpose of this article and accompanying illustrations is to explain certain methods which have proved quite satisfactory. These methods result in perfect restraint and there is little danger of hurting the animals or of those working with them being bitten.

Precautions to Be Taken in Handling Foxes

Although there is really nothing to fear in handling foxes it should be remembered at all times that if given the opportunity foxes will bite. Even young pups may inflict a painful wound. The bite of an adult fox is usually serious, the teeth may pass through a finger or the palm of the hand and painful infections often follow. When handling and examining foxes all day accidents are most likely to occur in the late afternoon when the men engaged in catching and restraining begin to become fatigued. Under such circumstances the practitioner engaged in fur farm work should constantly keep his eyes on his assistants and cease work for the day, or change his assistants, if he observes they are becoming careless. This applies on large ranches where perhaps two or three hundred animals are to be restrained. Even animals which are apparently very sick should be handled with caution. Except in the case of handling pups there is no advantage to be gained in wearing thick leather gloves.

On a small ranch the practitioner will often have to handle the animals himself. On larger ranches he should permit the regular ranchmen to catch their animals in the way they prefer. He may instruct the ranchmen in suitable restraint and when he sees rough handling he may make suggestions to improve the methods. Thus he not only protects himself and assistants from possible injury but avoids any responsibility should the animals be hurt.

Two men may handle and treat a fox but it will always be found a great saving of time and in all respects more satisfactory to have three persons in the pen or pens, two to catch and restrain and one to examine or treat.

Methods of Catching Foxes

The methods of catching foxes running at large in a pen requires consideration. Some ranchers use special nets, some tongs and still others only their hands. The nets are similar to those used by fishermen to land their catch, only the cord, ring and handle are much heavier. These nets must be handled carefully as a blow from the framework may injure a fox seriously. The animals are removed from the net with the aid of tongs or by hand.

Perhaps the best and safest method to catch a fox is to drive the animal into its den, block the chute, lift up the lid of the kennel and den, then gently place the tongs about the animal's neck. The head is then pressed down with the tongs and the fox picked up by the hind legs or the tail. The body is stretched between the hind legs in one hand and the tongs in the other. In this position the animal may be safely grasped by the neck and the tongs removed (Fig. 1). In using tongs injury to the teeth, caused by allowing the foxes to bite the metal, should be avoided as far as possible.

Catching foxes by hand is an art which requires considerable skill and practice. The natural tendency of the animals, when disturbed, is to run around the edge of their pen, not the centre. When two persons enter a pen one keeps the foxes on the move, the other places himself at a convenient distance from the wire wall, with legs conveniently braced, body turned slightly towards the direction in which the animals are moving, and right hand extended with fingers open. As the fox runs between the catcher and the wire, the body is bent quickly forward and the fox caught by one or both hind legs and the tail. At the same time the catcher swings around

on the balls of his feet, straightening his body and lifting the fox off the ground and swinging it at arm's length in a semi-circle to the left. There is no danger of straining the animal's legs or tail when it is swung in the direction in which it was traveling. The animal must be held at arm's length until further restraint is applied, that is to keep it well out of biting distance from the body. An experienced ranchman seldom fails to catch a fox by this method.

When being held by the hind legs some animals will attempt to curl up and bite the wrist, but one or two gentle shakes will usually cause the muscles of the back to tire and in a few moments they will cease to struggle. The neck may be grasped either with tongs or by running the fingers down the full length of the spine, continuously rubbing the vertebrae until the neck is reached. Curiously foxes will seldom bite when this is done with confidence. Another way to secure a hold on the neck is to allow the animal to obtain a grip with its fore paws on some object such as a box or chute. This should be near the ground. The fox is gently shaken with the hand holding the posterior extremities; this usually results in the animal extending its head between its forepaws. At the same time the free hand is raised above the shoulder and brought down speedily to grip the neck.

The Technique of Restraint

Regardless of the method used to catch a fox, the primary step in restraint is to grasp the animal by the hind legs and the neck, at the same time keeping its body fully extended (Fig. 1).

Fig. 1.—The first step in restraint. The fox is grasped by the neck and hind legs, keeping the body extended. Catching tongs are shown in use. The animal may be examined or inoculated without further restraint.

This position is usually sufficient restraint for a general examination or the administration of biological products. If desired, a strip of one inch bandage may be used to tie the mouth closed. For this purpose a piece about two feet long is suitable. It is held taut at both ends. The centre portion is presented to the animal. It will usually take it in its mouth. If it does not snap at the bandage the animal should be tapped on the nose with an instrument, pencil or with the palm of the hand with the fingers fully and stiffly extended. The bandage is crossed over the dorsal part of the muzzle, the two ends brought down and crossed under the lower jaw back again, and tied in about the middle of the muzzle. It may also be tied around the neck but this is not essential.

Use of the Speculum and Stomach Tube

Further restraint is necessary when an animal is to be given capsules, stomach or intratracheal injections, or to be put under anesthesia. To attain such restraint the fox is first held as shown in Fig. 1. The next steps are illustrated in Figs. 2 and 3.

Fig. 2.—The second step in restraint. The tongs have been removed. The man on the left is preparing to take all the legs in one hand to prevent the animal from struggling and scratching.

Here the tongs are discarded. The fox is held in an upright position, one person grasping the neck with the right hand and the hind legs with the left. The second assistant takes the hind legs in the right hand and the front in the left; the hind legs are then transferred to the left hand, the paws of all legs being conveniently divided between the fingers of this hand. Holding all legs in one hand prevents the animal from struggling and scratching and at the same time leaves a hand free for the speculum. The first assistant at the same time, grasps the animal's ears with three fingers between them and the thumb and little finger to the outside. This latter hold, combined with the grip around the jaws (Fig. 4) makes it impossible for the fox to turn its head.

In the position shown, the speculum may be used. There are various types on the market. The one illustrated is light, strong, and inexpensive and has the advantage of giving a clear view of all buccal structures. This particular instrument, consisting of two frames, one sliding within the

Fig. 3.—The third step in restraint. All legs are firmly grasped in the left hand and the speculum has been inserted. The man on the right has gripped the fox by the ears with one hand and transferred the other from the back of the neck to the throat.

other, may be made from brass rods and nuts welded together. It is useful in examining teeth, gums, tongue, throat and in pilling, passing the stomach tube or making intratracheal injections, etc. For the latter performance the use of the depressor (Fig. 5) exposes the epiglottis when the flattened bar is pressed on the base of the tongue.

With the speculum in position, pills and capsules are readily administered. They are placed on the base of the tongue and pushed out of sight with the rubber end of an ordinary pencil or with any suitable instrument. When large quantities of medicine have to be administered the stomach tube is ideal. A fairly stiff human urethral catheter, attached to a large syringe, makes

Fig. 4.—The fourth step in restraint. The final position of the hand over the jaws is shown, together with the speculum and stomach tube in use.

a satisfactory stomach tube. It may be passed either with the epiglottis exposed to insure it is in the esophagus and not the trachea, or one may be certain it is in the stomach when the whole length passes down the esophagus. In the trachea its passage usually is arrested a few inches from the syringe.

Fig. 5 shows several instruments useful in the restraint and treatment of foxes, namely tongs, speculum, urethral catheter for males and females, intratracheal syringe, tongue depressor and stomach tube. Instruments which are inserted into the body of the animal should be carried from pen to pen in a pail of disinfectant solution to prevent the spread of infectious diseases.

Conclusion

Numerous other methods of restraining foxes besides those described in the preceeding paragraphs are in vogue among

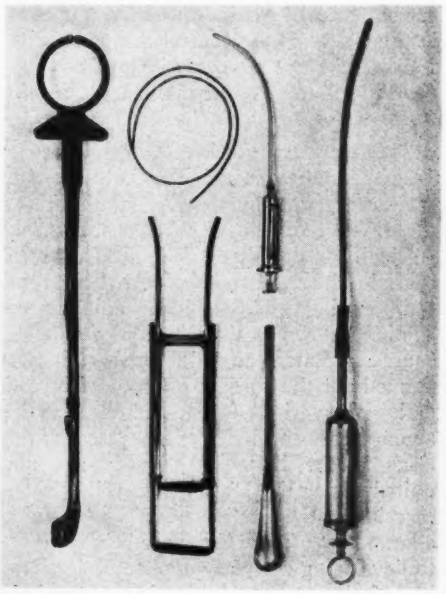

Fig. 5.—Instruments used in restraining and treating foxes—tongs, catheter, speculum, intratracheal syringe, tongue depressor and stomach tube with syringe attached.

practitioners and ranchers; some are more simple, others more cumbersome. Although when described in detail the above methods may appear somewhat complicated they are not actually so and with a little practice and capable assistants it is often possible to catch, restrain, pill and release a fox in less than a minute without danger of being bitten or of injuring the animal in any manner.

Much skill may be acquired in handling and treating foxes by studying their habits and anatomy and in practicing the use or passage of various instruments on the carcasses of pelters.

Government Research on Diseases of Fur Animals

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Bureau of Biological Survey

THE advent of every new industry always brings with it a multitude of complicating factors, and fur farming as developed during the present generation is no exception. Among the difficulties encountered by those who have pioneered in this field, disease control is not the least. Indeed, before improved methods for checking losses were applied, some fur farms were forced into bankruptcy through excessive losses of animals from disease.

The importance of the industry was early recognized by the Biological Survey, the Bureau of the U. S. Department of Agriculture dealing with wildlife, and a special unit was established for the purpose of improving conditions in fur animal propagation, known as the Division of Fur Resources. Later an additional unit was formed for the specific purpose of investigating the various forms of loss occurring among these species. Several research sections in the Biological Survey are now united under the Division of Wildlife Research. In the Section of Disease Control a large part of the efforts are being devoted to developing a more complete understanding of the exact cause and nature of the various nutritional, infectious, and parasitic diseases affecting fur animals.

The beginning of the program of research on diseases of fur animals was handicapped by lack of authentic literature on the subject. In fact, so little effort had theretofore been made to learn anything of the specific diseases of fur animals that veterinary practitioners were poorly prepared to diagnose and treat disease conditions in these species. Frequently workers in experiment stations were not free to carry on research in this specialized field. This was largely due to the restrictions on the funds available for animal disease research in these institutions and to the restricted staff of pathologists, as well as to the fact that there were few fur farms in the various states.

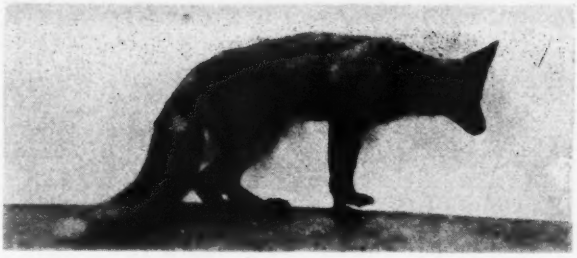
Since, however, the total number of fur farmers throughout the country was large, and since immense funds were invested in the industry, it was considered appropriate that the agency of the Federal Government interested in the conservation of wildlife on the open range as well as under controlled pen conditions should attempt to aid the industry through systematic research. It was soon recognized that distinct diseases peculiar to the classes of animals maintained on fur farms were common.

The old style of pens originally used for maintaining silver foxes, and the lack of understanding of their requirements, brought out many facts concerning parasitic diseases. Hookworm infestations were found on practically every ranch, but the species *Uncinaria stenocephala* was not the kind most frequently present among domestic animals. Ascarid infestations among young fox pups were frequently so heavy as to take a heavy toll of the pup crop during the first few weeks of life.

Nutritional diseases, rickets, and nutritional anemia, were frequently observed. The lack of an elementary knowledge of the nutritional requirements, and parasitic invasions, made diagnosis of infectious diseases difficult and uncertain. Even when the troubles were recognized as being other than nutritional or parasitic the infectious diseases to which fur animals were subject were not known, and the practicing veterinarians were ill prepared to diagnose and recommend treatment.

Since most of the fur breeders in the early days of fur farming were selling breeding stock, they were prone to obscure the fact that they were having losses, and the frequent selling and trading in breeding animals from nearly every ranch in the country helped make the situation one of such complete confusion that there could be no well-organized information on the diseases of fur animals.

With the stabilizing of the fur farming industry, however, an orderly method of operating most fur farms has come into being. A frank and unbiased group of men have continued in the industry, and are now engaged in producing pelts in a businesslike manner. The crystallization of the industry in the hands of intelligent producers has enabled the Section of Disease Control of the Biological Survey to deal with them as individuals and to coöperate with them through their state and national organizations.



Fox affected with lethargic stage of encephalitis.

It has been the Bureau's policy to make the most complete study possible of the conditions that cause greatest losses. The research workers attempt to investigate outbreaks of disease at their beginning, in as much detail as conditions permit, and then to follow the course of the epizootic until the losses cease. By constantly repeating this plan of action in their own laboratories, and in coöperation with responsible research institutions, a complete picture of fox encephalitis, fox paratyphoid, and distemper, has been gained. A better knowledge of rickets and other nutritional diseases has been worked out. More effective control of hookworms, ascarids, and lungworms has been established, and effective methods of eliminating ear-mites have been described by Biological Survey workers.

While in the past much of the investigational work conducted on the diseases of fur animals by the Bureau has been done in coöperation with scientific institutions and fur farmers in position to supply responsible information, it is planned to develop more studies along this line strictly within the Bureau's own organization. The laboratories in Washington are being supplemented by ample space for pens and experimental animals at the National Agricultural Research Center at Beltsville, Maryland, near Washington. The Section of Disease Control intends to develop suitable facilities at that place for making tests of pathological material sent in for examination, and for tests of vaccines and biological products intended to protect against or cure infectious diseases affecting fur bearers. Further studies will be made on prevention and elimination of parasitic infestations. Research on fur animal diseases in general will be conducted there.

Fox affected with paralytic stage of encephalitis.

Mink

Care, Handling and Common Diseases

By E. E. WEGNER, Pullman, Washington
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THE mink as a fur bearer is becoming relatively important and should attract the interest of the veterinary profession. This animal, technically known as *Putorius vison,* is a common inhabitant of the North American continent. Over this vast area, we find that the characteristics of individuals in certain localities are quite different from those of others. The variations are found particularly in the size of the animal and the quality of the fur. Many of the nationally known fur dealers quote on mink pelts, prices that depend upon the section of the country from which they are taken.

The more valuable pelts are those that are dark in color, with a dense, dark underfur well protected by rich, dark guard hairs. The two sections where the most valuable pelts are found in nature are (1) the interior of Alaska and British Columbia. Here is found an animal that is large, rugged, with a deep, dark, thick undercoat and beautiful lustrous guard hair. (2) the North Atlantic region—eastern Canada and eastern United States, where the animals are smaller, but have a beautiful, dark, dense, silky coat. The pelts from these two regions command the highest price on the fur market. Pelts from other regions of the continent are valued at different prices, depending upon the quality.

As the supply of wild-caught fur diminishes, there is an increasing demand for a supply from other sources, and, as a result, the pen raising of mink began to attract attention. We find some records of mink raised in captivity as much as thirty odd years ago; but perhaps it would be correct to say that, as a commercial enterprise, the raising of mink in captivity dates back a matter of only twenty years or thereabouts.

The early attempts at domestication were fraught with many disappointments because of lack of knowledge pertaining to the natural habits of the animals, but eventually it was found that the animals could be produced satistactorily under domestication. The difficulties of production under domestication, however, were not the only difficulties to be overcome, for the fur merchants had a distinct aversion to the ranch-raised pelt, and clung to the belief that the wild-caught pelt was far superior. These obstacles did not discourage the pioneers in mink breeding. They sought the finest stock that was to be had on the continent, and strove to produce the finest quality of pelts —and they have finally succeeded in convincing the fur trade that pen-raised mink pelts from superior stock are not only equal to but are superior to the general average of the wild-caught. Since this recognition of the ranch-raised pelt has been developed within the last four or five years, it is proper to say that a substantial foundation for the mink-raising industry has been secured just recently. From present indications it seems certain that this venture has excellent commercial possibilities and that it deserves the whole-hearted support, encouragement, and help of the professional veterinarians of this continent.

Losses Affecting the New-Born

Mink rear one litter of young each year. The breeding season is from late February to April 1 in the Northwest. When this season approaches, both males and females prepare physiologically for the mating season. The testicles of the male become

greatly enlarged and active, and the scrotum becomes plainly visible, even through the dense fur covering. The female responds by manifesting a period of estrum. This is not particularly obvious in the female, although careful examination may disclose swelling of the vulva, an indication that the mating season is at hand. The female usually accepts the male at intervals of seven to nine days during the breeding season, and ordinarily has as many as three distinct services at such intervals. At which of these matings conception takes place is not known.

Copulation is usually of prolonged duration, and under normal conditions it is not unusual for the animals to consume one hour in the act. Males are capable of a number of services daily, but perhaps two services, one in the morning and one in the evening, are about the maximum that should be allowed.

The period of gestation varies greatly in mink. Figuring from the last mating until the birth of the young, the time varies from forty to sixty-five days. An average of some twenty matings was shown to be forty-seven days. At the time the kits are born, the female usually refuses her food for a day or two. This should excite the interest of the keeper. The female remains in the nest box, and usually one can, by listening carefully, hear the cries of the new-born kits, indicating that the litter has arrived. The new-born mink is no larger than a small peanut. The skin is pink in color, and on first glance one would think it entirely bare. Closer observation shows that there are a few very fine, white hairs. The number of young in the litter varies from one to as many as eleven; a good average being three and a half to four and a half, although litters of six or seven are not uncommon. The young mink grow rapidly and may be weaned at seven or eight weeks of age, and at three to four months they are so large that they are difficult to distinguish from the adults.

Female mink are usually very satisfactory breeders, although cases of sterility occur. It is common, however, for the most of the females to mate, but a variable percentage of these do not conceive. The proportion that fails to conceive is about the same as in other animals.

The period immediately after birth is hazardous for young mink, and in this respect, of course, it does not differ from the general rule of nature. In a certain percentage of cases, when the young have very definitely been heard in the nest boxes, no young are found. In some cases it is presumed that the mother has destroyed her litter, although there is no way of knowing definitely whether they died naturally and were consumed, or whether they were destroyed while still alive and healthy. We have not been able to account for the cause of litter destruction. It occurs in cases where the feeding schedule seems to be entirely satisfactory. It is possible that certain females are definitely cannibalistic.

Certain powders used for the purpose of suppressing external parasites on the mothers have been considered responsible for the death of the young. In at least one instance that came to my attention there seemed to be good evidence to support this contention, as 64 kits were lost immediately after the treatment of the females, and when the nest material was changed and the powder removed as completely as possible from the remaining females, no more losses occurred.

Maggots in the nest boxes are also a cause of loss. Adult flies find their way into the nests, particularly if the nests are not kept scrupulously clean, and lay their eggs or larvae on or near the new-born kits. The loss may be considerable, and in any case there is an ever-present danger. Frequent examinations and giving the female an abundance of clean nesting material are essential to the well-being of the young.

Distemper

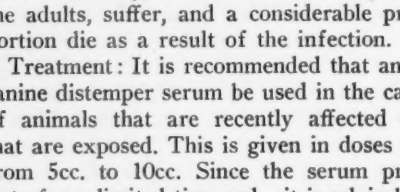
Distemper affects mink to a considerable extent, and it is apparent that the same virus that causes this disease in other carnivora causes the disease in the mink also. The symptoms, however, are somewhat different.

Animals are first noted to be ill, with loss of appetite, inflammation of the conjunctiva manifest by watering of the eyes,

and, as the disease advances, there is a characteristic discharge from the eyes, with a kind of eczema about the lids. A rather characteristic symptom in the advanced stages is the swelling of the feet, the feet sometimes swelling to several times their normal size.

The disease spreads in the mink herd, and a considerable percentage, perhaps more than 60% of the kits and 25% of the adults, suffer, and a considerable proportion die as a result of the infection.

Treatment: It is recommended that anti-canine distemper serum be used in the case of animals that are recently affected or that are exposed. This is given in doses of from 5cc. to 10cc. Since the serum protects for a limited time only, it is advisable



to treat the animals a second time after a two-week interval. The tissue vaccine should be a valuable product, but it is not readily available.

Acidosis

A condition commonly believed to be acidosis, and sometimes spoken of as "disease of the sheath" is not infrequently found in mink. The principal symptom is swelling and inflammation of the sheath, and usually a protrusion of the swollen, inflamed membrane. There is usually soiling and moistening of the area about the sheath, and the animal suffers considerably as a result. This condition is sometimes thought to be caused by local infection of the tissues, but it appears to occur rather regularly in animals fed on a diet containing too much meat.

When this condition is encountered, it is found advisable to reduce the percentage of meat in the ration and to add such substances as tomato, lettuce, milk, and mineral. Usually such a ration correction is followed promptly by marked improvement, and many of these animals recover completely. In some cases, however, when the condition has been very severe, the animals are rendered useless for breeding purposes.

Diet Deficiencies

While this brief article would not permit a discussion of the diet for mink, it should be noted that these animals are very susceptible to imperfect food mixtures, and while it is occasionally said that mink can be raised on any kind of food, this is not justified by the experience of most breeders. It is often found that the lack of essential food substances is ordinarily followed by an unhealthy condition of the animals. The diet should commonly contain a rather high percentage of meat or fish, supplemented by glandular tissues of the body, such as liver, kidney, heart, and other parts. Eggs and milk are very desirable, and some fruit or vegetable substances should also be included. Tomatoes and lettuce are especially recommended, but small amounts of fruits and other vegetables may be ground into the mink ration. The same care should be exercised in perfecting the mink ration as in the formulation of rations for other animals.

Internal Parasites

Internal parasites of mink have been studied to a limited extent.

Coccidia occur in both ranch-raised and wild animals. In some minkeries this disease has caused serious trouble and heavy losses. The first symptoms observed are those of the passage of mucus in the droppings. This is commonly of a greenish color and may be streaked with blood. Appetite is seriously interfered with, and loss of condition is to be expected. Many animals die as a result of this infection.

No effective medical treatment is to be recommended. It seems advisable to keep affected animals on wire floors in order that they may be as free as possible from re-infections.

Round Worms have been observed in mink, and their presence is characterized

by intestinal disturbance, with some interference with the general health, as evidenced by a harsh, dry coat. This parasite seemingly is rather uncommon in minkeries.

Lung Worms have been observed in mink, usually in tumorlike nodules in the lung tissue. These nodules contain small, interwoven worms. The life history of the parasite is not known. Treatment is unsatisfactory. Keeping the animals on wire floors and away from infected droppings would undoubtedly be helpful.

Tapeworms occur in mink, and it is believed that fish and very small animals may act as intermediate hosts. For this reason the suspected food supplies should be guarded, and any meat or fish showing small bladder-like cysts should be cooked thoroughly. No medicinal treatment has been reported.

Lung Flukes have been reported as occurring in wild minks in the Middle West.

Intestinal Flukes and *Gall Bladder* and *Liver Flukes* are also reported in mink. No effective treatment has been devised. Preventive treatment seems to be our best protection.

Proper management for the control of parasites is essential. Mink are now commonly confined in large wire cages with wire floors of three-quarter-inch mesh. These are raised off the ground, except while the young are small, and such management is quite effective in controlling all kinds of internal parasites.

Several months ago, careful examination of eight mink carcasses from widely separated minkeries revealed these animals had been entirely free from internal parasites.

External Parasites

The most common external parasites are fleas and lice, which cause the same disturbances as are common in other animals.

Treatment with derris powder, one-part, and starch or other diluent, two parts, is considered most effective. This is to be sprinkled into the fur and about the nest boxes, except as noted at or near the time of parturition.

Boils

It is not uncommon for adult mink to suffer from abscesses affecting the tissues about the head. Most frequently these are found on the sides of the face or on the top of the head.

When first noticed, these appear as swellings of the part, and are most easily observed when the animal looks directly toward the observer, when it is noted that the head is misshapen. At this particular stage the animals may show no general illness, although this depends somewhat on the location of the abscess and whether or not it interferes with mastication. As the condition progresses, the abscesses become larger and eventually break, and in these later stages the animal may show severe illness and deaths are not infrequent.

The causes of this condition are not well known. Some believe that these are quite generally caused by sharp awns or thistles in the nest material which make their way into the tissues about the mouth or work down through the fur into the skin. At least foreign material of this type can often be demonstrated in the abscess. In certain other instances it seems probable that tooth troubles may be responsible for the disease of the bones of the face, which could easily result in abscess formation. The practice of cutting the canine teeth of the mink is undoubtedly responsible for some tooth

decay, and probably sets the stage for cases of facial abscess. Some cases are perhaps caused by a local or systemic infection similar to that observed in man and other animals. Breeders have sometimes expressed the opinion that abscesses were in some way caused by improper feeding, but there seems little to support such a belief.

The treatment consists in incising the abscess and giving it thorough drainage. The cavities are sometimes enormous in size, as the skin of the mink is quite tough and thick. It is helpful to evacuate the abscess completely and then treat it by swabbing with tincture of iodine. Under proper treatment many of these cases recover, although it is not uncommon for recurrences to take place, probably being caused by the infection spreading in the subcutaneous tissue and breaking at a nearby point; or, in the case of foreign objects such as bits of hay or chaff, the incomplete removal of the offending substance may be the cause of recurrence.

Foreign Bodies in the Mouth

In mink it occasionally happens that bits of bone become wedged in between the teeth and in such a way that the animal cannot dislodge them and is sometimes rendered unable to eat. On several occasions I have observed animals that persistently left their food untouched, and it was apparent that the animals were unable to close the mouth. After confining such an animal and examining the mouth cavity, I found that a bit of bone had become lodged in the mouth and prevented the teeth from closing properly. It is usually an easy matter to remove this offending material, and the animal is given complete and prompt relief and suffers no permanent ill effect.

Cutting the Canine Teeth

This practice is not uncommon in several species of animals. It is practiced in the fox, occasionally in the dog, and sometimes in the mink. It is the belief of some breeders that the male is too severe and that cutting the tusks or canine teeth increases the margin of safety at breeding time. Observation has shown, however, that in all animals this operation is attended by some danger, and it is not uncommon to find that infection enters the pulp cavity and causes the tooth to decay, eventually becoming loose, and perhaps being lost. During this process, however, there is severe local disturbance, and it undoubtedly causes some general systemic disturbance, and while the visible loss attributed to this particular operation is slight, it seems apparent that the general health of the animal must suffer to a considerable extent.

In the case of the mink, it is my opinion that this practice is not justified. I believe it is quite unnecessary, and would not recommend it to the mink breeder.

Wounds

Wounds are fairly common in mink, as the animals are extremely active and are prone to fight viciously at times. As a general thing, the mink seems to be quite resistant to wound infection and may be expected to do quite well, even in the presence of severe tissue lacerations. Losses occur, however, as a result of infected wounds, and abscesses are not uncommon at the site of tissue injuries and these sometimes result fatally. At mating time particularly there is danger of infected tooth wounds. These are most commonly observed on the back of the neck in the female, and sometimes the tissue here be-

comes quite badly infected and swollen as the result of repeated irritations. This condition, however, does not usually require treatment, but it is common to observe that there is considerable swelling and injury to this part at breeding time, and adult females usually have a number of white hairs growing from this region as a result of repeated injuries.

Perhaps the next most commonly injured region is the region of the tail head. The animals frequently snap each other in this region. Swellings and abscesses sometimes assume considerable proportions before they are observed, because they are so deeply hidden beneath the long, thick fur that the swelling of the region is not apparent.

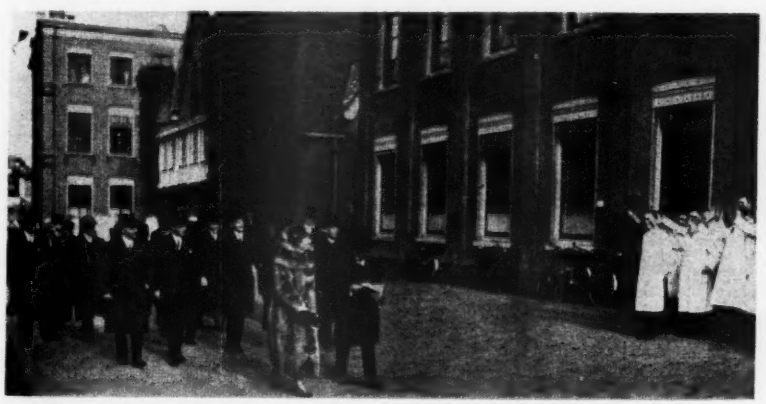
In severe cases, drainage and antiseptic irrigations are to be recommended. In mild cases treatment is unnecessary.

Pneumonia

Pneumonia is a fairly common disease of mink. It is probable that bacteriologically it is much the same as pneumonia in other animals. The losses, however, are usually sporadic, and while the disease may be infectious, it does not seem to be contagious. The predisposing causes may or may not be apparent, and animals sometimes suffer from this disease without apparent cause.

The conditions under which the animals are kept undoubtedly has much to do with the development of cases of pneumonia, and perhaps the greatest hazard of all is the moist, poorly ventilated nest box. It is not uncommon for the nest to become quite wet as a result of the moisture given off through the breath, and in winter particularly nest boxes may be found to be very damp and sometimes even frozen, instead of being dry, clean, and warm. Sudden changes of weather also seem to cause some cases of pneumonia.

In the case of such systemic diseases, the mink is not very demonstrative and the symptoms are not particularly indicative of the condition. Animals gradually lose their appetites, remain in the nest much of the time, may show more rapid respiration and perhaps a soiling of the nostril from inflammatory exudate. The disease may continue over a period of a week or ten days, during which time the animals gradually become weaker as the condition progresses. Death is the usual termination, and treatment is quite impossible, as any form of manipulation or medication creates so much excitement that it does more harm than good.



A QUEEN VISITS A VETERINARY COLLEGE

The illustration shows the Queen Wilhemina of Holland, her cabinet and other government officials on a tour of inspection of the veterinary college at Utrecht, July 19, 1936. The group at the right are veterinary students saluting the Queen. This and other illustrations of the official visit appeared in "Tydschrift voor Diergeneeskunde" (Journal of Veterinary Medicine).

THE CHINCHILLA

Chinchillas---Past, Present, Future

By B. B. COALE, Los Angeles, California
Los Angeles County Live Stock Department

FOR all time furs have been highly regarded by mankind. This was true during countless centuries solely because of their utility. Today, while this utility is ever present, fashion decrees the type, style, cut, and kind of a hundredfold more furs than utility ever commanded. That this is true, augurs well for the future of fur farming. But in these furs of the future, quality and beauty—luxurious beauty—are paramount essentials. If a sense of the utterly unattainable (for others) can be engendered in milady's mind by the possession of an adorning fur, well-lined will be the nest of him who supplies this want, whim, desire, or ambition. A few individuals are well on the way to supplying this all but utterly unattainable want of milady of wealth. For that delicately beautiful and most nearly unattainable of furs—the Chinchilla—is about to take its place once more in a limited way in the channels of trade. All credit for the resuscitation of these once numerous furbearers which were trapped to the verge of extinction goes to an American with vision.

A historical brief may not be amiss. *Chinchilla lanigera* and *Chinchilla brevicaudata* are indigenous to the rocky western Andean highlands of Peru, Chile, and Bolivia. These agile rodents especially the first mentioned were very numerous at one time, and for many years in the latter part of the nineteenth century many hundreds of thousands of pelts were exported annually. However, unrestricted destruction eventually resulted in their entire disappearance from trade. Then embargoes were placed upon the export of both pelts and living specimens and their capture or destruction made a serious offense. The destruction had however all but proceeded too far and there was no evidence of restocking under natural conditions. Numerous government sponsored attempts to raise them in captivity in their native countries and thus facilitate restocking failed.

Into this picture of destruction, failure, and defeat strode a keenly observing American of vision, the late M. F. Chapman, of California. A mining engineer by profession his calling had permitted him to observe the disappearance of these furbearers and it was with intense interest that he watched the repeated but unsuccessful efforts to rear the animals in captivity. Finally the lure of his vision getting the better of his interest in his profession, he was, by special governmental decree, given permission to capture and take to this country a limited number of Chinchillas. An idea of the difficulties encountered by this pioneer in the very beginning may

be gained when it is realized that it required five years to effect the capture of eleven living, apparently healthy, specimens of *Chinchilla lanigera.*

The transportation of these little fur balls from their native habitat 10,000 to 16,000 feet above sea level to the coast and then the nurturing of them through a long sea voyage in the tropics offered many seemingly insuperable obstacles. But the vision persisted and the trip was successfully accomplished, only one animal perishing enroute. Thus was born "The World's Original South American Chinchilla Farm" on a Southern California ranch.

Many were the difficulties of handling, housing, feeding, and breeding encountered by this pioneer fur farmer. Imbued with that spirit which knows no recession and virtually living with his live stock the problems one by one were met and solved. Not without many a disappointment and many a temporary setback were these battles won. Profiting, however, by his South American experiences and observations it was possible to avoid many a pitfall, which had proved the undoing of numerous similar enterprises in our sister republics to the south. And so this unique enterprise began to expand and prosper.

Today there are on this ranch nearly nine hundred healthy, active, alert, thriving Chinchillas. This is more than in all of the rest of the world combined. Some of the original animals are among these nine hundred and are doing well, reproducing regularly although approximately twenty years old. Several ranches in the West, the northern states, and in the East have acquired foundation stock from this fountain head and are making real progress. Also in various parts of their native countries these little beauties are now being reared successfully. Thus a new live stock industry stands upon the threshold of commercial production, and an ever increasing luxury consuming public beckons for the product. Truly here is one industry in which overproduction is not a factor.

To the veterinarian anatomy is fundamental. The following data except where otherwise specifically noted refer to *Chinchilla lanigera.* In these animals it has not been studied in detail. Internal anatomy corresponds in general to that of the guinea pig. The external appearance of *Chinchilla lanigera* is indicated in illustration herewith. The chief differences in appearance between the two species are that *Chinchilla brevicaudata* is slightly larger, has a shorter tail, shorter and smaller ears, and is slightly darker in color. The dental formula of the adult is $2(I\frac{1}{1}M\frac{4}{4})20$. Full maturity is gained at about one year of age at which time the animals weigh 20 to 24 ounces. The all important fur is indescribably soft and delicate—almost ethereal in nature. No wonder it is prized!

The handling, care, housing and management of these bright-eyed little fellows is now quite well understood. Their very friendly nature makes the necessary physical handling a very simple matter. They are readily picked up with the ungloved hand and offer only slight resistance.

It is not known what constituted the natural feed for these animals. About all that was available in their native habitat and range were coarse fibrous grasses and the bark of very hardy shrubs. Roots are ruled out as a possible natural feed as the animals do not—apparently cannot—burrow. Reared artificially it has been learned that a varied ration of whole grains, commercial rabbit pellets, alfalfa hay, and a variety of fresh green vegetables suffices.

The housing and shelter provided these animals will of course vary considerably with the climate in which they are reared. It need not be elaborate. A few pertinent suggestions are offered. Chinchillas thrive much better when given as much fresh open air as possible. Therefore avoid dungeon-type shelters. It is, however, advisable to furnish a place of retreat and shelter from extreme heat. An insulated triple-walled nest box constructed of wood and fibre-board approximately 2 by 2 by 3 feet with an indirect entrance near the top has been found satisfactory. This nest box

placed in an airy, well lighted room not smaller than 3 by 6 by 6 feet accommodates two or three adults or a pair and their litter nicely. Wire mesh floor construction has never been necessary as they are very clean animals. Wooden floors kept clean and dry are very suitable. Having the rooms a minimum of six feet in height is merely a concession to the ease of entry, cleaning, and handling for the caretaker. It is not necessary for the welfare of the Chinchillas.

Mating may occur at any time of year in Southern California. The gestation period is 111 days, seldom varying from this figure more than one day either way. The young are born well-developed and completely furred; in a very few hours after birth they may come out of the nest box and romp about their quarters. Litters average slightly less than two. The females object but slightly to the handling of the young, offering no resistance but emitting a peculiarly wistful grunting until the babies are replaced. Dystocia of various types is occasionally encountered. Carefully performed cesarean operations have been uniformly successful. In fact in more than one instance the same female has had several cesarean operations with no apparent unfavorable sequelae.

There are no known specific infectious diseases from which these animals suffer. None of that character has been experienced in the more than fifteen years since their introduction to this country. This is indeed a fortunate situation and one which every effort should be made to perpetuate.

A disturbance, apparently metabolic in nature, but of undetermined etiology is characterized by excessive salivation. This drooling, while only sufficient to keep the area immediately adjacent to the mouth moist, is constant and persists indefinitely. It is accompanied by unduly rapid growth of the incisor teeth rendering occasional clipping of these elongated organs necessary. The affected animals seem improperly nourished although they continue to eat and reproduce regularly. Very gradual emaciation results and after many months —even years—death results from inanition. For want of a better term this condition is referred to as "slobbers." Autopsy examinations of animals so affected have been unproductive of clews to the cause or causes.

The future of this infant industry appears exceptionally favorable. The potential market for these regal furs is as virgin soil. A generation much less wealthy and less luxury-minded absorbed millions of these pelts. The few remaining full length women's Chinchilla fur coats are valued at from $35,000.00 to $50,000.00 each. On their infrequent appearances at the most glittering of social functions they are guarded as would be the crown jewels. Does more need to be said regarding the possibilities? Here surely is one field not overcrowded.

At the present time there are very few Chinchilla pelts reaching the fur markets of the world. A small number is offered for admission to this country occasionally. The only Chinchilla pelts produced in this country are from animals dead from disease or accident. Few, if any, of these are prime. From $5.00 to $50.00 each are received for use as trim and in repair of existing garments. It is estimated that if a goodly number of matched prime pelts could be assembled prices ranging from $250.00 to $400.00 each might be realized. The pelts of these regally wrapped rodents become prime in late December to early February in Southern California depending somewhat upon the feeding, the age of the animal, and individual idiosyncrasies. They remain in the "prime" about one month.

Careful breeding and production records were kept from the first by the original Chinchilla breeder and are being continued in detail by his son and capable successor, Mr. R. E. Chapman. The latter is not only proprietor of the World's Original South American Chinchilla Farm but is easily the world's foremost authority on Chinchilla husbandry. From childhood he has worked with, lived with, and literally grown up with this most unique enterprise. The excellent condition of the animals under his care, the simplicity and suitability of the housing arrangements, the clarity and

mathematical precision of the record sheets —each detail of management portrays more vividly than volumes might the intelligent application of carefully considered plans.

In conclusion the following suggestions are offered for the consideration of the veterinary practitioner. Fur farmers are diligently searching their respective localities for competent specialized veterinary assistance. Fur farming is comparatively a new but rapidly progressing branch of the live stock industry. Its problems, its unknowns are numerous. But few veterinarians are specially qualified to render the service required. Make it a point to meet the fur farmers of your community. Interest yourself in their problems. A considerable amount of authentic information regarding the specialized husbandry necessary and the disease conditions encountered is available from governmental sources—state, federal, and foreign. Attend local fur association meetings. You will be welcomed. And, if the barrage of questions showered your way does not drive you to make most diligent use of the previously mentioned literature, your experience will differ from mine. The challenge and the opportunity which this field offers should be welcomed by veterinarians. The opportunities for mutual benefit are obvious.

What To Do with the Carcass

By E. J. FRICK, Manhattan, Kansas

MOST fur-farmers proceed to bury all dead animals as soon as possible. This also holds true of the carcass as soon as the pelt is removed at pelting time. This is the natural thing to do but this little article is written to call your attention to the fact that by so doing you destroy much useful evidence. The knowledge that can be obtained from the "remains" can assure you that your stock is in good shape or it can inform you that a heavy loss is headed your way and if recognized can be averted. To be more explicit, suppose a rancher at pelting time carefully examines the bodies of his pelted animals. He finds they have a good normal colored muscle, excellent subcutaneous fat, and on ripping open the chest and body cavities the lungs look pink (depending on how killed), the liver is a normal dark red, the intestines have no worms in them and everything looks healthy to him. He can reasonably feel that he has been feeding properly and that he has no chronic enemy devitalizing his stock. That is a comforting worthwhile bit of information that should not be ignored as it has been in the past. However, let us suppose the lungs have dark solid areas on their edge, or the liver has little yellow spots, or the intestines are thick and roughened, or something does not look right, the fat may be too yellow or the muscles too pale—all you need realize is that something is wrong with the carcass. The next intelligent thing to do is take it to your veterinarian. He should be a graduate from a college. He should have a microscope. He should be trained to examine the tissue and tell you just what the trouble is. No other group of men are as expert along this line and can as intelligently help you as the graduate veterinarian. Learn more about him. He should be your friend and you should be his. Let's see what he finds! Those yellow spots on the liver are abscesses—he smears the contents of one on a slide, stains it, places it under the microscope and shows you the tuberculosis germ. Those lung spots proved to be lung worm lesions. The intestines are loaded with hookworms. The ear stumps full of dirt show up ear mites. Finding out these things represents the best possible type of insurance for future healthy stock and better fur farming.—*American Fur Breeder,* Dec., 1933.

Common Sense in Fox Farming

By E. E. SWEEBE, North Chicago, Illinois

FUR farming, a great industry primarily developed by promoters in the selling of breeding stock at fabulous prices, is now a stable, legitimate business operated for the profit made in the marketing of raw pelts.

In the beginning the industry attracted many individuals as a get-rich-quick scheme. The so-called "ranchers" knew little or nothing about fox farming and cared less; they entered the business because they had been sold on the possibilities of each pair of fox raising four or five pups, and each mature pelt selling for $150 to $200—an income of $800 to $1,000 per year from each pair of breeders.

Many novices in the business suffered a painful disillusion, especially those who took a "flyer" at the business, and thousands of dollars were lost. As late as a year or two ago, hundreds of ranches could be found in a state of dilapidation, and without livestock.

Like all other enterprises, however, there have been many breeders who gave serious study to problems affecting the silver fox and by following carefully, the work of scientific investigators have succeeded in their efforts and now represent the fox farming industry which produces yearly millions of dollars worth of raw pelts.

Successful fur farming is no more difficult than the successful breeding of other species of livestock. It has been accomplished by the observance of several principles, experience (a costly teacher) and by scientific research in fox diseases and nutritional disturbances of animals in captivity. It is impossible to discuss the entire list of infections and nutritional diseases in this paper; therefore I take this opportunity to call attention only to the most prevalent conditions encountered by the fur farmer—those responsible for the majority of losses of litters, and young and old breeding stock.

Parasites

External and internal parasites have been the bugbear of all fur farmers. The average rancher, not aware of the necessity of sanitation and of the action of vermifuges and insecticides, has suffered untold losses in both young and old stock.

External Parasites

Ctenocephalides canis.—Fleas are common to the silver, black and blue fox because of confined quarters and inability to change bedding in breeding kennels at frequent intervals. Careful disinfection of kennels twice a year and the use of effective insecticide powders on the animal as well as on bedding, however, destroys these parasites without injury to animals.

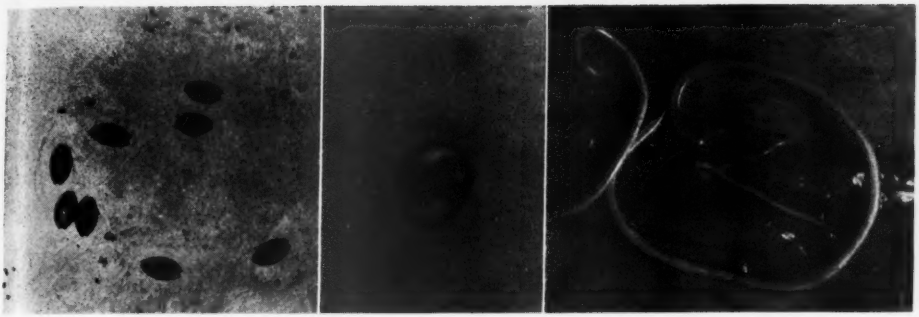
Otodectes Cyanotis. — Ear mites have proved disastrous on many ranches. These parasites not only cause much distress to the animal, but death may result from secondary infection extending to the middle ear. Considerable damage results also to the fur of head and neck; also many fine tail tips have been destroyed by ear mite infestation attacking the tail tip from contact with the region of the ear.

Internal Parasites

Lung Worm. — Lung worm infestation probably is most difficult of all parasitism to control and eradicate. The infestation is highly contagious by contact with the nasal secretions of infected animals and is especially destructive to young and undernourished animals. Many mature breeders may harbor the lung worm parasite without evidence of pronounced symptoms, a menace to the remainder of the breeding stock and to young litters.

Lung worm infestation occasionally is mistaken for distemper or common colds. Differential diagnosis, however, can be made easily on post mortem examination and microscopic examination of trachea and bronchi secretions, demonstrating the lemon shaped parasite ova.

Treatment is of little value in lung worm infestation. Strict sanitary measures may carry animals up to pelting season, when



Left to right: Lungworm eggs (Eucoleus aerophilus); fox coccidia; and fox roundworms.

infected stock can be replaced by healthy animals.

Ascaris.—Round worms are common to pups, especially if breeders have not been freed from parasites at or before the mating season. The majority of ranchers, therefore, routinely worm all breeders at mating season, also during the summer when litters are half grown. It is usually good practice to give vermifuges to pups two or three times during the developing stage. The first dose should be given at three or four weeks of age, repeated in 60 to 90 days, depending upon the extent of infestation.

Hook Worms.—Hook worm infestations are more destructive to young and old foxes than ascaris, due to the mode of infestation. Severe intestinal disturbances often result due to secondary infections and loss of animals due to lowered resistance and low tolerance to vermifuges.

Microscopic examination of fecal material may be necessary to diagnose definitely hook worm parasitism and to institute proper treatment. This condition is easily confused with other forms of enteritis.

Coccidiosis.—Coccidiosis in foxes has been reported; however, there is some question as to the prevalence of the condition. Successful treatment by drugs is questioned by many authorities, also the extent of damage the infestation may cause. Dietary measures and enforcement of sanitary precautions which prevent reinfestation seem to be successful control measures.

Taenia.—Occasional infestations with tape worms have been reported; however these parasites are rarely found due to strict control of the fox ration. The animals seldom obtain meat infested with the tape cyst, consequently infestation rarely occurs.

Infectious Diseases

Infectious diseases are not prevalent in ranches that are carefully operated. Sporadic outbreaks of distemper and encephalitis have been reported but with strict enforcement of sanitary measures and with judicious use of vaccine and serum, these infections are handled without heavy loss.

Distemper.—On certain ranches where the virus of distemper has been definitely demonstrated by animal inoculation, prevention and control with homologous serum has been successful. Although the virus of distemper in dogs is transmittable to foxes, the two viruses are not identical. Homologous serum made from fox virus from red or silver foxes gives greater immunity than dog serum or serum made from dogs hyperimmunized with fox virus.

Fox ranchers who use care in selecting new stock from healthy ranches and prohibit frequent trespassing on the ranch need have little concern about distemper.

Encephalitis.—This infection may occur spontaneously or as a complication following distemper, respiratory or intestinal infection. The cause is bacterial and bacterins and serums have been found valuable in the prevention and treatment.

So-called fits, convulsions, etc., resulting

from intestinal parasitism and toxemia should not be mistaken for encephalitis of infectious origin. Fits usually respond quickly to treatment by the correction of the diet or removal of cause, in case of parasites.

Cystic Calculi

Loss of foxes due to calculi in bladder have been demonstrated on a large number of ranches. The condition is difficult to diagnose; however, bloody urine and emaciation is usually noted. The calculi may vary in size from sand-like particles to stones of twice the size of a pea. Severe inflammation usually develops due to irritation of these foreign bodies and rupture of bladder wall results in toxemia and death. Although the causative factor of cystic calculi is not definitely known, scientific investigation has proved that a deficiency of Vitamin A is a predisposing factor.

Nutritional Deficiencies

Dietary conditions due to improper or unbalanced rations are the predisposing causes of the majority of common fox diseases.

It must be realized that the fox is essentially a carnivorous animal and in the wild state had access to food substances comprising a complete ration and nature also provided the animal with the necessary instinct for proper selection.

In the domestication of the fox the diet has been restricted entirely to raw or cooked muscle meat far from fulfilling nutritional requirements; or to soft foods or carbohydrates and in too many instances rations lacking in the essential vitamins and minerals. It is true that the fox must have a sufficient quantity of food to maintain normal nutrition, but it is also highly important that such food must be of adequate nutritional value. To be balanced in proteins, fats, starches and minerals is not sufficient. Vitamins are absolutely necessary to assure proper assimilation and utilization of the food.

Although vitamins appear in varying quantities in natural foods the amounts are small and especially in the diet of domesticated foxes are not sufficient to maintain proper nutrition and reproduction. Supplementing the ration is, therefore, necessary in order that these nutritional factors be supplied in a sufficient amount to prevent and correct deficiency diseases.

The following vitamins are indispensable to animal life and play an important rôle in fox nutrition:

Vitamin A.—Promotes growth and body resistance. Aids in the building of resistance to general infection, especially respiratory, by strengthening the membranes and tissue. Vitamin A contributes to better appetite and aids digestion. Certain other conditions such as ophthalmia, bladder stones are common symptoms caused by the lack of Vitamin A.

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Richest sources: Haliver oil and cod liver oil.

Vitamin B_1 and B_2 (G).—These two vitamins are closely related in their effect. They are usually found together in nature and stimulate appetite and digestion and promote growth.

Both are required by the mother for normal reproduction and lactation. B_1 protects against polyneuritis. B_2 (G) is termed the anti-pellegra vitamin, Vitamin B_1 (G) deficiency is closely associated with black tongue in dogs.

A deficiency of Vitamins B_1 and B_2 (G) often results in digestive disorders and skin affections, characterized by unthrifty appearance of coat.

Richest sources: Liver, liver extract, malt extract, wheat germ, yeast.

Vitamin C.—The antiscorbutic food factor, while generally regarded as of little importance in fur bearing animals because scurvy is not an animal disease, should not be overlooked entirely as it is obvious that scurvy-like conditions (black tongue, ca-

nine typhus, and eczema) may possibly be related to a lack of this factor.

This vitamin is present in fresh fruits, fresh leafy vegetables, fresh tubers and ascorbic acid. It is especially abundant in citrus fruits and peppers.

Vitamin D.—The antirachitic vitamin; regulates and is essential for the metabolism of calcium and phosphorus. Sunlight contributes to the formation of Vitamin D in nature but it is of questionable value in fur bearing animals.

Vitamin D is essential in the pregnant mother and offspring to prevent rickets and assure proper development of skeletal structure, building strong bones and teeth.

Richest sources: Cod liver oil, haliver oil, viosterol.

Vitamin E.—The chief function of Vitamin E, according to present knowledge, is the prevention of certain types of sterility and infertility.

In the male, the gradual loss of reproductive power due to lack of vitamin E leads to complete and incurable sterility; but fertility can be maintained, so long as a few normal tubules remain in the testes, by treatment with vitamin E.

Female sterility due to vitamin E, on the other hand, is curable, since only temporary tissues are damaged. A deficiency of vitamin E in the female interferes with placental function causing eventual resorption of the fetus. (Deficiency of Vitamin A, on the contrary, causes failure of ovarial function. Adequate amounts of Vitamin A must be provided since it has many other functions in addition to its essential part in nutritional processes of reproduction.)

Richest source: Wheat germ oil.

Vitamins are stable in the natural state but when exposed to heat or altered from the natural form soon lose potency. To insure results from vitamin feeding, products of standard, bio-assayed potency should be used. In no instance should the vitamin potency of a proprietary mixed ration be relied upon.

Guard fence and yards on one of the Nieman Ranches in Wisconsin.

Due to simplicity of feeding, many ranchers have wasted good money for vitamin products supplied in powdered form or in ready mixed feed. Although additional labor is required in preparing diets to which vitamins are added at the time of mixing the feed, full vitamin potency can be assured and in the end is cheap protection against diseases which result from the lack of these nutritional factors.

The practicing veterinarian should take more interest in fox diseases. He should be equipped to make microscopic examinations, diagnose external and internal parasites and also be in a position to offer suggestions for the correction of nutritional diseases.

The majority of fox breeders are always in search of sound scientific data which will enable them to increase production. The veterinarian is the logical one to supply this necessary information.

Problems in Reproduction

THE principal reason for domestication of an animal is the preservation of the species in question for the purpose of reaping a gain in the form of either food or rainment from this animal, in return for the labor and expense involved in its care and feeding. Undoubtedly, at the dawn of civilization, the demands upon the newly acquired animals were simple and in keeping with their ability to yield food and rainment within physiological limits. Consequently, as long as the conditions of rearing or herding simulated those in nature, diseases incident to the rearing of young had not made their appearance then, or, at least, did not play an important rôle.

Today the breeder has increased his demands in regard to quantity and quality of yield from his domestic animals as payment for "board and room." Necessarily the breeding problems have become more complicated and intricate. Breeding is now a science. Whenever the animal husbandman in the course of his breeding operations, disobeys or neglects any of the fundamental physiological laws of breeding hygiene, his "breeding sins" will, sooner or later, bring disastrous results either in the parent animals or in the offspring.

The practicing veterinarian, therefore, will be interested in the following review of recent experiments at solving some of the problems connected with reproduction in fur bearing animals.

The hypophysis excretes a hormone called prolan. This hormone is carried by the blood circulation to the ovary, where it stimulates the growth of the follicle. Under the influence of the prolan, the ripening follicle produces the folliculin or ovarial hormone. This latter hormone performs three functions: (1) It causes congestive changes in the vulva and vagina; (2), it stimulates growth of the uterus and the secretion of uterine mucus, thus producing a preparedness for copulation and conception; and (3) it causes the psychic symptoms of rut. The ruptured follicle forms the yellow body. It excretes a hormone called progestin or progesteron, which exerts an influence upon the further development of the body. Another one of its functions is to prevent the ripening of new follicles. It is, therefore, antagonistic to prolan. Its function will fade out, as soon as the corpus luteum retrogresses. The rut of the male is brought about in a similar manner.

Disturbance of these functions at any point of the cycle is apt to cause irregularity in heat and, possibly, may result in sterility. It is therefore obvious that under certain conditions of dysfunction of the sexual apparatus, the necessity may arise to stimulate the libido artificially.

Naturally, the method most productive of immediate results is the one of selective breeding, correct feeding, and proper care and management with regard to hygiene and sanitation.

MÜLLER (1931) pointed out a certain causative relationship between lungworm infestation and abortion in silver foxes. He found that the irritation of the lungworm causes a bacterial invasion of the blood stream. This mixed infection is responsible for the fatal termination of pregnancy in most cases. In 1930 he had selected four vixen which in 1929 had aborted nine cubs and only one cub was born alive. He vaccinated them with mixed bacterin, with the result that these four vixen whelped 12 living cubs. Thus by combating lungworm disease and by prophylactic vaccination, Müller was able to increase the birth rate of these four vixen 1200%.

G. E. SMITH (1931) investigated the physiological effect of aphrodisiacs on foxes. He concludes that the evidence obtained up to the present time would indicate that the proper feeding of foxes is the best aphrodisiac, and if the females have been properly fed and are in good condition, they will readily come in heat. At the same time, the evidence obtained would indicate that under certain conditions, with foxes that are on the border line of good and poor condition, beneficial results can

be obtained by a proper administration of yohimbine. But, on the other hand, if the foxes are in poor condition, it is absolutely useless to obtain or expect any beneficial results from feeding yohimbine or any other specific aphrodisiac.

WINNITZKI (1933) injected hypophysis anterior lobe hormone (anteron) subcutaneously into four male foxes and 11 vixen at a time (early in August) when the environmental conditions were the most favorable for the expected results. Six of the eleven vixen treated exhibited swelling and congestion of the vagina characteristic of heat. However, the psychic behavior of none of the eleven vixen indicated estrum, when they were placed together with either the hormone-treated or the untreated males. The hormone-treated males exhibited anatomical effects of the treatment. Winnitzki concludes that the hormone injection promises to increase the fertility in fur bearing animals; at least it appears to be a weapon in the fight against sterility and impotency. In polygamous breeding it is apt to increase the efficiency of the males. He hopes also that it will be possible to induce a second estrum in vixen which have lost their cubs soon after birth. In animals in which the heat period falls late in the spring, it may also become possible to shift the heat period to an earlier date, which would be of great aid in the development of the young and their fertility during the next breeding season. Finally, hypophysis anterior lobe hormone has a distinctly stimulating effect upon milk secretion and may give promising results in the treatment of agalactia, which not infrequently follows parturition.

ROCHMANN (1934) states that most vixen come into heat naturally, without the use of artificial stimulants. Cantharides, he says, are not tolerated by most foxes; moreover, this drug irritates the mucosa of the stomach, and the kidneys seriously. Its use as an aphrodisiac is, therefore, out of the question. His experience with yohimbine was likewise unsatisfactory. Many fox ranchers, Rochmann observed, get nervous when the foxes do not show estrum by the middle of March. They feel bound to arouse and hasten the mating instinct of their foxes by giving them yohimbine. But it is very likely that these same foxes would have come into rut anyway if they would have been left alone.

MACHACEK (1935) combined prolan with concentrated vitamin E. Twenty vixen were used in an experiment. One of them was ill and did not breed. The remaining 19 vixen gave birth to a total of 87 cubs (an average of 4.58 cubs per litter). Eleven of these vixen which whelped a total of 51 cubs (an average of 4.64 cubs per litter) had whelped a total of 29 cubs (an average of 2.64 cubs per litter) the previous year, in which no prolan-vitamin E concentrate was given. The other eight vixen which whelped 36 cubs (an average of 4.5 cubs per litter) came from litters which totaled 30 cubs (an average of 3.75 cubs per litter).

Machacek summarizes his experiments as follows:

During the experiment the heat period was restricted to three weeks; its course was normal. The gestation ran a normal course without accidents. The period of gestation was hardly exceeded. Formerly, it was the rule that the gestation would extend two days beyond the normal period. The cubs in the litter acted contented and were normal. In only one litter did one large cub die. The average size of the litter, following treatment, had risen in one year from 2.64 to 4.58. All vixen had plenty of milk and were able to rear their young to maturity. In addition, there seemed to be a beneficial influence upon the disposition in that the vixen seemed to be contented and did not exhibit nervosity. They tolerated manipulation of their nest boxes as early as the first day. Carrying of the young was observed only in one vixen. White discoloration of the fur of the cubs was practically absent.

WITH regard to the effect of prolan injection upon the sexual apparatus, Koch (1936) summarizes his experiments, and those of others by stating that the results obtained, so far, are unsatisfactory.

Occasionally, especially when small amounts were administered, heat was observed in the animals treated. However, in none of the animals had it been ascertained whether estrum was actually due to the hormone injected, or whether it could have occurred without the injection. In the majority of experiments, the result was negative. It was impossible, by means of prolan injection, to excite rut in such animals which had not come into rut in time. Neither was it possible to induce a second rut in vixen in which the heat had faded out without the vixen having conceived. Nor was it possible to improve the character of heat in those animals which showed disorders of the rutting period. Koch considers, therefore, prolan injections in silver foxes as useless. He warns that overdosage of prolan may cause hyperirritation of the ovary with a resulting sterility lasting more than a year. A large dose of prolan causes a ripening of the follicle, but produces also a quick luteinisation, thus making it possible that the ovum cannot leave the follicle, but coalesces with the yellow body. It is, therefore, difficult to give the correct dosage of prolan.

In a series of experiments (50 foxes) Koch gave ovarial hormone (Unden) in the food in order to highten the symptoms of rut in cases where the rut was either insufficient or incomplete. In practically all the vixen the symptoms of rut would be heightened. Especially noteworthy is the fact that the action of the preparation occurred within a few hours after administration. From some of the vixen the reports were less encouraging. Evidently, it is not possible to produce an effect by means of hormones when the symptoms of rut are lacking entirely.

In another series of experiments (70 foxes) Koch gave ovarial hormone (Unden) to the foxes daily in the food for different periods of time, during March and April. It was his purpose to ascertain whether rut could be induced thus. The results were negative, except in those cases where the treatment was continued for only a short time. Koch is inclined to believe that large amounts of this hormone have a deleterious effect.

In still another experiment in which four vixen were used, the question was investigated whether it is possible to induce a second rut when the first rut did not result in pregnancy. Two vixen which did not become pregnant during the natural period of rut came into rut again after treatment with ovarial hormone (Unden) and were bred successfully. In two other vixen which had aborted, heat could not be induced again.

Koch recommends the use of ovarial hormone (Unden) in all those cases in which the estrum is weak or insufficient. Vixen which had exhibited weak rut in previous years should be given ovarial hormone prophylactically. Animals which do not seem to come into heat in time, one may treat by administering ovarial hormones in small amounts over short periods. Results are uncertain. Prolonged administration is harmful.

The question, whether a second rut, and thus a second gestation can be induced, is still unsolved. Koch warns against being too optimistic in this respect. Caution as to the desirability of this feat is certainly in place.

Notwithstanding certain appearances to the contrary, nature is never extravagant or wasteful. The principle of economy rules everywhere in nature. It is well known that there exists a certain antagonism between certain performances. If we increase one phase of animal production, another phase is bound to suffer. The increase in egg production in poultry takes place at the expense of meat production; the increase of beef production in cattle takes place at the expense of milk production; the increase of wool production in sheep, takes place at the expense of meat production. It is not unlikely that the same law applies to fur bearing animals. There is still the question whether doubling the number of pregnancies may not interfere with the quality of the pelt.

Whether the disorders and dysfunctions of the sexual apparatus are to be relieved by dietary or by therapeutical measures must depend ultimately on the careful evaluation of the case history by the attending veterinarian.

Fox Encephalitis

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FOX encephalitis appears to be widely distributed among foxes in captivity and persists as an enzootic disease over long periods of time on the larger fox ranches. It is caused by a virus which is easily filterable through ordinary bacteria-proof filters. The disease may be identified by the occurrence of specific intranuclear inclusions. Although in the past there has been confusion of this disease with canine distemper, the virus of fox encephalitis is a distinct entity and markedly different in its characteristics from the virus of Carré.

Clinically fox encephalitis is a disease of the central nervous system, as the most usual symptoms are referable to irritation or damage in the brain and spinal cord. Pathologically the disease is a generalized virus infection and involves particularly the endothelial cells of the smaller blood vessels. The injury to the vascular system results in hemorrhage and cellular degeneration. As the central nervous system is functionally most susceptible to this type of damage, the symptoms observed are of central nervous system origin.

Demonstration of a filterable virus associated with so-called distemper in silver foxes was accomplished by Green (1) in 1926, and the presentation of fox encephalitis as a distinct disease was made by Green, Ziegler, Halvorson, Green, and Dewey (2) in 1928. Subsequent investigations of this disease have been carried out as a cooperative study by the Bureau of Biological Survey and the University of Minnesota, results of which have been published by Green et al (3).

Enzootic Occurrence

Fox encephalitis is now known to have persisted continuously on one large fox ranch for 15 years and has been identified by laboratory studies during each of the past ten years. Usually its spread among foxes in breeding pens is slow with only occasional losses, in many cases aggregating not more than 5% during an entire year.

Epizootic Occurrence

Under certain conditions a more rapid spread of the disease is observed with small outbreaks in epizootic form. Such a spread is often apt to occur after such procedures as re-mating foxes in the fall. Occasionally a well defined epizootic spread of this disease is observed in early summer soon after the fox pups emerge from the kennels. Epizootics of this disease frequently develop when foxes are congregated and allowed to mingle in large fur runs or ranges. Here the disease occurs in explosive form, sometimes involving as high as 40% of the animals present. The disease may make its appearance within six days after entrance of foxes into a common enclosure and the height of the epizootic may be reached within 21 days, with almost complete subsidence within four weeks after entrance.

Transmission

The disease is transmitted by direct contact with upper respiratory secretions carrying the virus. Identification of the virus in nasal washings of both sick and contact animals has been accomplished experimentally. The occurrence of virus in the nasal secretion has been shown to be due to direct involvement of the nasal epithelium.

Morbidity and Mortality

In some outbreaks of fox encephalitis morbidity and mortality are almost identical, with practically all foxes showing symptoms succumbing to the infection. In other outbreaks the morbidity may be as high as 25% with a mortality of only 2%. This difference in degree of morbidity and mortality is due to the occurrence of distinct types of the virus as well as to changes in the virulence of the same virus type. The mortality from fox encephalitis will therefore vary from as low as 2% up to 40% of the population involved.

Course of the Disease

Experimentally it has been shown that fox encephalitis runs an extremely rapid course as far as visible symptoms are concerned. The incubation period varies from two to six days, depending upon the type and virulence of the virus. The onset is abrupt with the sudden development of

Fig. 1.—Lethargic state and peculiar standing attitude shown by foxes experimentally infected with encephalitis.

symptoms referable to damage in the brain and spinal cord. The duration of symptoms is short, varying from one hour to three days, the usual duration being less than 24 hours.

In this disease death occurs in highly susceptible animals at the onset, upon the general invasion of the virus. In more resistant animals which recover from the infection, the virus appears to persist for several weeks with symptoms occurring only during the early period of general invasion.

Symptoms

The abrupt appearance of the initial symptoms is characteristic of this disease. A violent convulsion is the most common initial symptom. This is usually followed by a lethargic state in which the animal appears to walk around asleep. The animal may then become conscious and develop a state of hyperexcitability, which terminates in another convulsive seizure again followed by the lethargic state. Both spastic and flaccid paralysis are common symptoms and may occur alone or in conjunction with hyperexcitability, convulsions and lethargy. Careful observation often shows that a general weakness is the first symptom, although the wild nature of a fox usually prevents the discernment of this symptom. Later in the stage of symptoms disseminated paralysis may be difficult to differentiate from a true general weakness. Occasionally there are varied symptoms such as muscular twitching and definite hallucinations. Sudden death is usual but death often supervenes only after a prolonged terminal coma.

Physical Findings

Careful observation of experimental animals shows that the development of major symptoms is usually preceded by a definite

Fig. 2.—Terminal lethargy of fox encephalitis.

rhinitis for 24 hours, during which clear liquid drips from the nose. Occasionally a purulent discharge develops. The eyes are generally clear with little suggestion of any discharge. Sometimes the eyes are involved with an interstitial keratitis and sometimes a nystagmus is present. Hemorrhage into the anterior chamber of the eye is not uncommon. Stools are usually soft with much mucus present. The stools may be blood-streaked or, with hemorrhage into the lumen of the bowel, may consist of blood only. Fox encephalitis is such an acute disease that there is usually no loss of weight and animals die in full flesh.

Necropsy Findings

The most striking finding at necropsy is the paucity of marked gross pathological changes. The essential gross character of fox encephalitis is hemorrhage, as the disease is primarily an involvement of the blood vessels. Hemorrhages commonly occur in the heart and may be subpericardial, subendocardial or intramural. Gross hem-

orrhages also involve the adrenals, pancreas, thymus, submaxillary glands and lungs. Tissues in which gross hemorrhages are of greatest importance are those of the central nervous system. Here the gross hemorrhages are exaggerations of microscopic hemorrhages which occur throughout the brain and spinal cord.

Fig. 3.—Foxes with experimental encephalitis. Fox shows sleep-walking state and spastic paralysis.

Microscopic Pathology

Microscopic examination shows hemorrhages of varying degree in many organs but most constantly in the central nervous system. The specific microscopic pathology is large acidophilic inclusions within the nucleus of endothelial cells. These cells show margination of nuclear material and a fully developed inclusion is centrally located and separated from the nuclear wall by a clear zone. A fine network of threads passing through the clear zone connects the inclusion with the nuclear membrane. Although these inclusions are found most consistently in the endothelial cells of the small blood vessels, they may be found in any cells of the reticuloendothelial system. They may be found, therefore, in hystiocytes and occasionally also in large lymphocytes. Not infrequently the intranuclear inclusions are found in the hepatic cells of the liver and in the medullary cells of the adrenal. This disease may be distinguished from the central nervous system form of canine distemper by the presence of these specific inclusions in the case of fox encephalitis.

Immunity

Foxes recovering from this disease are permanently immune. Natural immunity appears to be the most important factor in the mortality of this disease. Highly susceptible foxes die at the onset of the infection; animals with a sufficient degree of natural immunity show some symptoms at the onset but recover. Many animals are apparently so resistant that no invasion of the virus can be discerned. As the disease is so abrupt, it does not seem that acquired immunity plays any rôle in recovery from this infection. If the natural immunity is very low the animal dies upon invasion of the virus. With some degree of resistance, the animal does not die and an acquired immunity eventually eliminates the virus. The

Fig. 4.—Experimental fox encephalitis. Red fox with flaccid paralysis of hind quarters.

acquired immunity has been shown to be due to the development of antibodies in the blood.

Antiserum

A rather efficient serum for passive immunity to fox encephalitis can be obtained by the hyperimmunization of recovered foxes. Weekly injections of brain, liver or spleen virus continued over a period of six months are necessary to produce a satisfactory antiserum.

Vaccination

Attempts to develop an efficient vaccine made from killed virus have given unsatisfactory results. Here, as with many other viruses, it appears that high concentrations

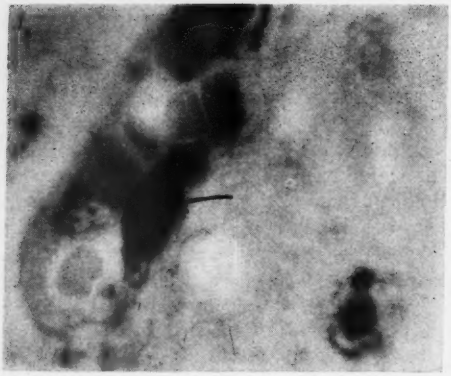

Fig. 6.—Section of brain. Intranuclear inclusion of fox encephalitis in endothelial cell.

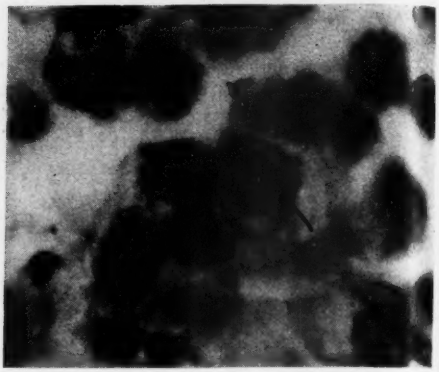

Fig. 7.—Section of spleen in fox encephalitis. Histocyte containing intranuclear inclusion.

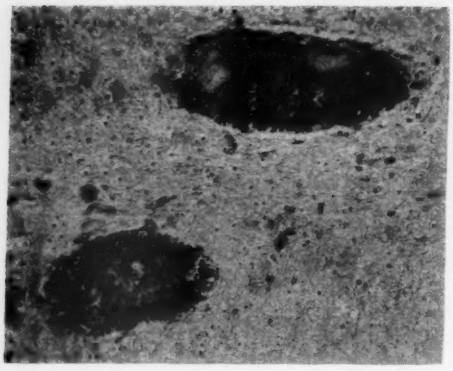

Fig. 5.—Pathology of fox encephalitis. Perivascular infiltration with round cells in central nervous system.

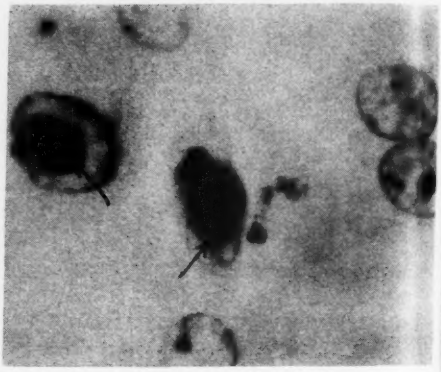

Fig. 8.—Section of liver in fox encephalitis. Liver cell with intranuclear inclusion on left. Endothelial cell with inclusion in center.

of killed virus must be used, concentrations greater than are found in the tissues of infected animals.

Serum-Virus Vaccination

Extensive attempts to develop a serum-virus combination for vaccinating against fox encephalitis have shown this procedure to be highly dangerous because of the development of delayed infections. After injection of serum-virus mixtures a fox is protected against immediate invasion of the virus and appears well for about four weeks. At about that time many animals so injected die from an acute attack of the disease. Development of acquired immunity to this disease is so slow that by the time the serum effect has worn off, many animals are still highly susceptible and persistence of the virus causes delayed infections. Although experimentally animals can be immunized by the use of serum-virus mixtures and subsequent injections of serum at two-week intervals, the procedure has proved somewhat dangerous and unwieldy, and after six months, 8% are still highly susceptible.

Control of Fox Encephalitis

From rather extensive experimental tests with fox hyperimmune serum, it appears that acute epizootics of encephalitis can be controlled by passive immunity under conditions permitting successive injections of

antiserum. With more extensive recognition of this disease it should be possible to have available commercial serums for the control of acute outbreaks. Successful vaccination against fox encephalitis is still a complex problem requiring further investigation of the immunological aspect of the disease.

Tenotomy in the Fox

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Tenotomy in the Fox

Perhaps the principle cause of lameness, broken legs and backs in foxes, ranched under cage conditions is due to the falls resulting from the common wire climbing habit of foxes, especially when they are scared. An operation in silver foxes, highly successful, on the Frantzhurst ranches, has been performed for a number of years on all but show animals. It is not a difficult operation and consists of cutting the deep digital flexor tendon.

The operation is described as follows: The muzzled fox is restrained and the toe of the foreleg is extended until a distinct taut band, a branch of the deep digital flexor tendon, is distinctly felt under the skin. After disinfecting the skin with tincture of iodine a curved No. 12-blade, Bard-Parker knife point is inserted under the tendon and outward pressure exerted until the toe gives as a result of a separated tendon. Apply collodion to the wound if necessary and repeat the operation on the other foreleg. Some foxes have to have all the digital flexors of the forefeet cut to stop climbing. Should the surgery be so unfortunate as to go too deep and cut the branches of the digital artery a slight hemorrhage may occur but it is seldom severe enough to demand treatment. This operation is commonly practiced on many ranches by laymen using razor blades. Veterinarians should be familiar with the improved technique.

A different technique consists in the use of a probe-pointed bistoury, inserted through a small perpendicular incision in the skin after the manner of tenotomy in the horse. However, there seems no disadvantage to the larger skin incision resulting from the technique shown in the illustration.

Although the toes may appear less "cat footed" and the pasterns more dropped than on an unoperated animal, the lessened ability of the fox to dig and climb wire fences make this operation worth while for practitioners to perform.

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Diseases of Fur Bearing Animals

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Handling

Although kept in captivity, wild animals retain much of their savage wildness and strongly resent handling. They live in constant fear of their natural enemy—man. It is fear rather than wickedness that prompts them to bite viciously when cornered. While it is true that we can tame individuals to a point where they tolerate and become accustomed to our presence, once we attempt to forcibly restrain them their natural wildness comes to the fore.

When restraining wild animals for treatment we must do so forcibly taking every precaution against being bitten and scratched. It is almost unbelievable to watch the quickness of movement that wild animals are capable of when attempting to escape. We must outwit them at every turn either by force or coaxing. The actual administration of medicine is often difficult and the operator must needs be somewhat of a genius to figure out ways and means of successful restraint. Various instruments have been designed to asist us in handling the different species. Holding tongs and long handled catching nets for the larger animals along with heavy leather gloves or chain link mitts for the smaller species are standard equipment on fur farms.

It is best to let the owner, if he seems so inclined, do the actual catching and most of the restraining. Handling fur animals is their every day occupation and they generally prefer to catch their own valuable live stock. After the caretaker catches and properly subdues the animal one can proceed with the examination and treatment. There is generally help available and it is not the veterinarian's place to chase wild animals around and around a pen.

To be successful the veterinarian must be able to do something for the animals that the owner cannot do himself. In this respect fur farmers are like dog fanciers as they consider themselves quite capable of handling ordinary conditions. It is sometimes best to administer even simple medicines in such a way that the rancher will be impressed with the difficulty of the operation. Should the medicine be recognized and the technique simple the caretaker will note carefully and apply the same remedy on future occasions; quite likely in conditions for which the treatment is not suitable. It is then but human nature to blame the veterinarian for an untoward outcome.

Diagnosis

As in other live stock, the diagnosis of disease is dependent upon familiarity with the healthy fur bearer so that we can detect a deviation from normal. A close observation of the affected animals, careful check of the history and general ranch methods are important. Past experience is invaluable but only follows the opportunity of seeing sick animals. Because of fear, sick fur bearers tend to hide or suppress symptoms of disease in the presence of man. If one has an opportunity of observing a wild animal that is not aware of being watched it may show a clue that would otherwise be missed. Contrary to former opinion, fur bearers are not to be compared to the dog in disease and treatments. If we do make a comparison it would be that they are similar to the house cat. Because of their extreme nervous disposition wild animals are at best poor patients.

With the exception of temperature and pulse, the accepted principals of diagnosis are applicable to fur bearing animals. It is to be remembered that a thermometer is of little use in diagnosis. Wild animals are extremely nervous and the excitement of catching and forcible restraint will elevate the temperature to such an extent that readings are of no value. However, a subnormal temperature does indicate collapse and impending death. For the same reason, an increase in the pulse rate and respirations, except when other symptoms of pneumonia are present, is likewise no indication of disease.

Administration of Medicines

Liquids are best given by way of a stomach tube. This is the safest and most simple way. There is a grave danger that otherwise some of the medicament will go down the trachea during the struggles at the time of administration. With the aid of a mouth gag and proper restraint it is comparatively easy to pass a stomach tube in most species of fur bearing animals. A long nozzled dose syringe may also be used to advantage. It is inserted well down the esophagus so that the liquid may be forced into the stomach. Milk of magnesia is a good laxative and is preferable to castor oil for fur bearers.

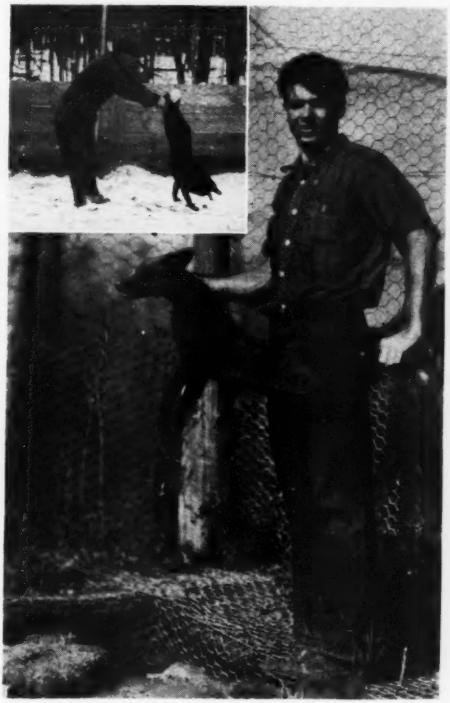
Capsules and tablets are easiest given with curved forceps and proper mouth gag or "Rombough" fox tong. Place the capsule well back in the mouth and be careful not to allow the animal to bite them. This is important when using vermifuge capsules. Should an accident occur and the capsule be broken in the mouth, immediately release the mouth gag and hold the animal up by its hind legs. If necessary apply artificial respiration and swing the animal by the hind legs. Most worm capsules are volatile when broken and the gas released is heavier than air. When inhaled it locates in the lower lungs and is breathed out with difficulty. Tetrachlorethylene is the worst offender and produces alarming symptoms, although it is seldom fatal.

Ether is a safe general anesthetic but should not be forced as there is possibility of collapse. When indicated, barbital and its derivatives are good sedatives. Foxes and most other fur bearers won't tolerate morphine and their reaction to it and other toxic drugs is much the same as in cats. Strychnine, coal tar products and carbolic acid have no place in fur farming practice.

Methods of treatment are similar to those used in small animal practice. However, no attempt should be made to keep sick wild animals in a hospital. They will only go down hill rather than up, and rapidly lose condition when kept in strange surroundings. They should be treated at the ranch and immediately returned to their own pens.

Leg Amputations

This operation is the commonest surgical one called for in practice. Ranchers will often bring in animals that have been maimed from steel traps or that have been



Inset: Catching a fox on the run. Below: Holding a full Silver.

fighting. The technique is similar to that in the dog or cat except that no bandage is applied and the incision is not sutured but is treated as an open wound. When the bone is sawed off it is wise to take a file and round off the sharp edges. If this is not done properly the irritation will prevent proper healing. A satisfactory procedure is to give a general anesthetic of ether, apply a tourniquet and remove the maimed leg well above the diseased tissue and arrest the hemorrhage. The bone is taken off as far up as possible so as to leave sufficient muscle tissue to extend down beyond the end. A large flap of skin is left and the wound is packed with gauze soaked

in iodine and the incision sutured to hold the pack in place. Remove the sutures and gauze in 24 hours and treat as an open wound. It is surprising how well the wound will heal up providing it is kept open to provide ample drainage. A good application is iodine and Friar's balsam equal parts and applied daily to keep the wound aseptic and to prevent maggots. This point is an important one during the fly season.

Wounds

Wild animals and especially the fox are likely to develop septicemia from even superficial wounds. Bite wounds in the long fur are often overlooked and usually abscess. All wounds should be treated so as to provide ample drainage. They do better when not bandaged. If situated on the legs and the lymph glands become swollen, immediate and high amputation is indicated because of the danger of gangrene and general septicemia. Except when well applied in setting fractures bandaging is not practical. Fractured legs respond well when the broken bones are held in place with light splints and bandages. It may be necessary to renew the cast several times if the animal chews off the bandages.

"Boils"—Abscessed Wounds in Mink

This condition is common in mink and fitch and is caused by infection following bite wounds. Cases generally occur after the breeding season, or when more than one mink is kept in a pen. It may also be due to wire cuts becoming infected. There is a possibility that the condition may be infectious. The abscesses usually occur around the head and neck. Pus that forms tends to burrow under the skin rather than to head out. Septicemia may occasionally develop, but seldom does as mink seem better able to withstand infection than the fox. Treatment is surgical. When the abscess is ripe, incise it freely and evacuate the pus. Treatment may have to be repeated should further abscesses form. This is generally the case if it has been left untreated and broken of its own accord. Proper drainage is important or the infection tends to pocket and form new abscesses.

Sinusitis—"Big Head" of Foxes

This condition is caused by infection gaining entrance to the gums and nasal sinus by way of a broken tooth or lacerated gum. In puppies it is met with during the teething period and in adults follows tusk clipping. Pathogenic bacteria are always present in raw meat and once an avenue of entrance is provided may cause trouble. One or more foxes may show the condition but it is not infectious. Foxes stop eating and the face becomes swollen on one or both sides. Sometimes it is so severe that the animal is unable to close the mouth and the edema may extend down the neck. The eyelids become swollen and a rusty-colored discharge runs from the nose. Treatment consists of pulling a tooth in the vicinity of the swelling. The canine, third premolar and fourth molar are the teeth usually affected. The gums are edematous and the teeth loose where infection is worst. After pulling the tooth, open the cavity with a blunt probe and syringe out with antiseptic solution. Pulling the tooth provides drainage and quantities of pus will be evacuated. Place the fox in a separate pen and feed soft food until recovered.

Paralysis or "Straddles" in Fox Pups

This condition is met with in puppies about three months of age and generally occurs in shy litters. It is caused by climbing the wire when frightened and falling down with sufficient force to cause injury. The puppy will walk stiffly with a straddling gait or will have lost the use of its hind legs. There is no control of the hind legs and if scared it may fall down and when struggling to rise appears to have a convulsion. When its equilibrium is regained the pup moves about with a straddling stiff-legged lope and carries the hind quarters higher than normally. No injury is apparent but pressure in the pubic region causes pain. It is difficult to diagnose and is confusing unless one has seen such cases. The stiff-legged jack rabbit hop is characteristic.

Treatment consists of placing the puppy in a separate pen and feeding carefully for several weeks. The pup is in great pain and

fails rapidly for some 10 days but usually recovers in three weeks. When recovered the pup will be smaller than his litter mates and should not be returned to their pen, as more than likely his brothers and sisters will turn cannibal and eat him the first night.

Mortality in Shipping

Wild animals, especially those sent in from the trap line, are poor travelers. Mortality is high following long shipment of the smaller species of fur bearers. Animals may die a few hours after arrival or are dead when received. Autopsy examinations are negative and death appears to be due to fear and nervous excitement during the trip. Faulty shipping crates are often responsible. Crates should be provided with two compartments, one open wire fronted and the other closed in with boards or sacking to allow the animal to be in complete seclusion. Warm, dry nest box, fresh water and food are also important. When received the animals should be immediately placed in a proper pen and kept quiet and undisturbed until familiar with the strange surroundings.

Pneumonia

This disease is frequently the cause of death in mink and other water animals during the changeable weather of late fall and early spring. While these animals are great swimmers, the guard fur protects the underfur from getting wet. When confined in pens they are susceptible to cold penetrating rains and soon become wet and chilled. Cold, damp nest boxes are responsible for many cases of pneumonia. Pens for all species should be provided with a warm, dry nest box and packed with straw which must be changed whenever it becomes damp or soiled. Tail scurvy is also seen where the pens are not kept clean and dry. During the seasons of alternate freezing and thawing pneumonia in lung worm infested foxes is likewise common. Treatment is symptomatic along with advice on proper construction of nest boxes to keep out draft and dampness.

Digestive Disorders

Foxes and other fur bearers are subject to a number of stomach and intestinal conditions due to improper feeding and to parasites. Catarrhal enteritis in a mild, chronic form is not uncommon. It is frequently found on ranches where the diet consists largely of mush cereals. Foxes are unable to handle coarsely ground or raw cereals. Irregular feeding is also a primary cause. Another cause is that of dirty feed pans, especially where milk is being fed in large quantities. Chilling from wet and inclement weather should also be avoided. The color and consistency of the fecal deposits is a good guide to the condition of the digestive tract. If the feces are covered with mucus, tinged with blood or loose and dark in color it indicates enteritis and improper digestion.

To correct the condition change the diet and provide a suitable ration. Fresh raw beef should be fed for a few days until the bowels are normal and then change to a proper ration. If the diarrhea is not checked feed ground raw bone for a meal or two. Milk of magnesia is indicated to clean out the intestinal tract. Bismuth, salol and sulphocarbonates may be used for a few days as an intestinal antiseptic. It is important that fecal tests for parasites be made and if necessary, anthelminthics administered.

Impaction of the stomach sometimes occurs from overfeeding or irregular diet. Animals that are starved between meals may over eat and cause gastritis. The fox will show uneasiness, quick breathing and bloating. Palpation may reveal the hard impacted stomach. Apomorphine hypodermically to empty the stomach is indicated at once and may be followed with milk of magnesia and intestinal antiseptics. The rancher should be advised on proper diet and intervals of feeding.

Fox puppies may develop digestive trouble shortly after weaning. These are due to improper diet and are often a result of milk and cereal feeding. Carnivorous animals should be fed a proportion of raw meat as soon as they are able to eat. Eating raw meat at an early age is natural for wild animals and is in accordance with their habits in the wild. Raw milk in quantities is not easily digested by carnivorous animals. Too much cod liver oil is laxative

and may also have a tendency to upset digestion.

Diarrhea is a prominent symptom and the fecal material is dirty yellow in color and has an offensive odor. Puppies are often stunted and may be bloated and pot-bellied. Where the diet has been milk and cereal slops it should be changed to a proper ration that includes raw meat. Milk should constitute only a small part of the diet. It is better digested when fed in junket form. Actual treatment is that of a mild laxative, intestinal antiseptics and a straight raw meat diet for a few days followed by a corrected general ration comparable to that fed to adults. Except in clinical cases of rickets, cod liver oil is not necessary in the diet where the ration is adequate in vitamin and mineral requirements.

Diet Deficiency Diseases

Rachitis—Rickets is a disease of young animals and is usually noted shortly after weaning. There is an impaired nutrition of the body due to a faulty diet which is lacking in bone forming elements. The disease has been observed in foxes, mink, other wild fur bearing animals and domestic rabbits. Rickets is a diet deficiency disease and is characterized by digestive disturbances, softening of the bone and marked deformity of various parts of the skeleton. While cod liver oil is indicated in the prevention and treatment of rachitis, recent investigations prove that too much of it will upset the digestion and may bring about the condition we are trying to prevent. Digestive rickets is seen on ranches that over feed cereals, milk and cod liver oil.

Young animals with rickets have a tendency to become bow-legged. The long bones are curved and the joints enlarged. Deformity of the bones of the face and enlargement of ribs at their attachment to the sternum sometimes occurs. Fox puppies may become so weak that they crawl on their elbows and hocks. General weakness, intestinal disturbances such as bloating and diarrhea are also prominent symptoms. Young animals with rickets become stunted, and show a general malnutrition evidenced by emaciation and a harsh open pelt.

Treatment is immediate correction of the diet to a proper ration containing fresh raw meat, ground bone, vegetables, cereals and milk fed only in quantities that will be soaked up by the cereal. Cod liver oil or viosterol may be administered to clinical cases for a week or two. If the history shows, as it may, that they have been getting too much cod liver oil it should be discontinued. Intestinal medication may be indicated to correct the digestion. In rabbits the diet should likewise be changed to include the necessary essentials.

Acidosis in Mink.—The term "acidosis" is a mis-nomer but is one that has come into general use to describe a diet deficiency disease in mink. Sheath trouble or so-called acidosis is found only on ranches that feed a diet consisting entirely of meat, fish and cereals. Mink that are fed sufficient minerals and vitamins, as represented in the ration by bone meal and fresh vegetables, do not develop this condition. The disease is easily produced experimentally by feeding mink a diet devoid of all vitamins and minerals. Further research is necessary to determine the lack of which vitamin or mineral is responsible for the disease.

The trouble usually starts in the late winter following a feeding schedule of several weeks diet of frozen meat and fish. Leafy vegetables are not obtainable at this time and the animals get little or no sunlight. Unless canned tomatoes and cod liver oil form a part of the ration at this time, the mink may develop alarming symptoms. Males show the more pronounced early symptoms. When examined the sheath and belly fur is wet from constantly dribbled urine. From its scalding, the skin of the abdomen becomes inflamed and denuded of hair. The penis protrudes and the sheath becomes edematous and tumor-like. Convulsions are common in both sexes as are unthrifty conditions and a harsh open pelt. The eye loses its bright, beady look and is sunken in the head. Mink finally become comatose and die in this condition. The course may be several weeks and a number of mink will be affected, and show varying degrees of sickness. Following recovery

the males may have chronic lesions of the sheath and penis. Due to phimosis and paraphimosis they are often useless in the breeding stud.

Treatment—It is surprising how quickly mink will improve and return to normal when the diet is corrected. Canned tomatoes and cod liver oil are high in vitamins, and along with raw bone should be a part of the winter diet. This is especially important when frozen foods are used. Surgical interference may correct the chronic lesions in male mink.

Other Deficiency Diseases.—Even when an infectious disease is suspected it is well to inquire carefully into the feeding methods. Disease may be the result of a combination of parasites, deficient nutrition and poor ranching methods. In some cases a faulty diet is evidently responsible for an animal killing its young. This may also be an inherent vice and if continued when the ration is adequate, the offender should be eliminated at pelting time. Lack of bone meal in the diet is a common error; at least 50% raw meat and 5 to 10% raw ground bone should be included in the ration.

In certain districts in which goitre is prevalent this disease is also seen in fur bearing animals. When it has it has been diagnosed, or the ranch is in a known goitre locality, potassium iodide should be incorporated in the diet. Ordinarily iodine is not required to any appreciable extent and its use might be detrimental if over done. Prescription for feeding is as follows: Dissolve 1 oz. of potassium iodide in 1 quart of water to make the strong solution. For feeding take 1 oz. of this strong solution and dissolve in a quart of water and give 1 oz. of this weak solution to 20 foxes in the food once daily. Dosage for other fur bearers in proportion.

Fur bearing animals frequently exhibit nervous symptoms. These may be secondary resulting from faulty diet or unsuitable surroundings. Their extreme nervousness makes them respond to slight irregularities. Convulsions are common from excitement. Mink, marten and other small species are especially prone to throw a fit when excited by catching or fright. Cleaning pens, shoveling snow, fire crackers, running water, mating season excitement and many other minor causes may stimulate their nervous center to the extent that they develop a nervous hysteria characterized by continuous convulsions. This type is usually a minor consideration and animals recover when quieted. Convulsions are also a common symptom of certain diseases.

Parturition

Dystocia.—As a rule foxes have little trouble at parturition time. Occasionally, however, dystocia is met with and professional aid is required. This condition is handled much the same as it is in the dog and cat. Manipulation with obstetrical forceps or the straightening of the puppy in the pelvis with the finger may correct the condition and facilitate delivery. Following the removal of the first pup and in cases of uterine inertia, pituitrin is indicated. In difficult cases a caeserian section may be attempted. The technique is the same as in dogs, but surgical interference should be considered only as a last resort. The chances of recovery are good following an aseptic operation but the prognosis should be guarded if the vixen is weak from prolonged labor. The live puppies may be given milk from an eye dropper and kept on a hot water bottle until a house cat with kittens is secured for a foster mother. Cats make good mothers for orphaned young of all species of fur bearing animals.

Metritis.—Inflammation of the uterus may follow dystocia and parturition. This is a common sequel after the removal of dead pups. The condition may be acute and cause death from puerperal septicemia or else be chronic with little constitutional disturbance except the vaginal discharge. Acute cases occur a few days after parturition and are evidenced by inappetence and depression. On examination the vagina is found inflammed and there is a foul smelling discharge from the vulva. Treatment is warm normal saline douches and aspirin or sodium salycilate tablets internally. The vixen requires special nursing on the part of the rancher and a proper diet to build up her resistance. A live spar-

row or small rabbit along with raw beef or warm blood may be necessary to coax her appetite for a time.

Mammitis.—Mastitis is fairly common in foxes and generally occurs at the time of birth or within a few days afterwards. This condition may be brought on from chilling, injury or too much milk for the number of puppies in the litter. Females so affected become restless and their puppies whine continually. It is natural for new born puppies to whine for a few hours after birth but as soon as they have suckled once they settle down and are seldom heard from thereafter. If the puppies do make audible sounds after they should have settled down, the female should be examined for mastitis. The affected mammary glands are hard and hot from the inflammation present. Treatment is to milk out the glands and apply warm camphorated oil. Give a mild laxative of milk of magnesia and prescribe aspirin every five hours. The rancher should be instructed to repeat the massage and camphorated oil every three or four hours and may also hold the vixen and allow the pup to nurse. If the female is too nervous to allow this the pups will have to be hand fed or given to a mother cat. Should one or more glands develop abscesses the treatment is surgical.

Eclampsia.—This condition generally occurs about ten days after parturition but may be seen in pregnant females and also within a few days to two weeks after the birth of puppies. Symptoms are spectacular and might be confused with poisoning. Restlessness and increased respirations are followed by the fox falling over in spasms with tensed muscles which hold the limbs rigid. Treatment is to give a cold water rectal enema and calcium gluconate intraperitoneally. Chloral hydrate per rectum may be used to control the spasms and should be followed by barbital or potassium bromide as a sedative. The puppies will have to be hand fed for a day and may then be returned or given to a foster mother.

Parasitic Diseases

The prevention and treatment of parasites is an important phase of management on all fur farms. Fur animals are kept in relatively small enclosures that soon become seeded down with parasite eggs deposited by infected stock. Parasites that have a direct life cycle are the species that cause the most trouble. It is to be remembered that fur animals are kept in unnatural surroundings and are thus probably more seriously affected than domesticated animals that harbour corresponding species of parasites.

Fortunately for the fur farmer, a large number of parasites found in wild animals require an intermediate host. In general artificial feeding rations do not include the intermediate hosts so that these parasites seldom become important in ranch bred animals. However, on small ranches that feed fresh fish, rabbits and other intermediate hosts we may see serious infestations. Autopsies on animals taken from the wilds seldom fail to show several different species of parasites. On the other hand ranch bred animals, other than the fox often harbour no parasites. Undoubtedly, however, wild animals caught in their natural habitat and placed in confinement for breeding stock may be adversely affected by the parasites they may carry. Lowered resistance from parasites along with the unnatural surroundings probably accounts for many of the deaths that occur shortly after capture.

The ideal treatment of parasites in fur bearing animals, as in other live stock, is prevention. With known life histories we can break the chain and prevent further infection. It would seem wasted energy to treat animals for parasites and then return them to an infected pen. It is true that clinical cases must be treated to tide them over. Mass ranch treatment is of questionable value unless supported by rigid sanitation and a previously confirmed diagnosis of parasitism by fecal test. Impervious floors of boards and wire runs are coming into general use on fur farms to prevent parasites.

Parasitic infestation causes the most trouble in young animals. The degree of infection is always heavier and the clinical manifestations greater in fur bearing animals under six months. At this age further

infection is usually prevented by the cold weather. Adults apparently may harbour parasites without being seriously troubled. The danger here of course is the fact that they contaminate the pens and act as carriers to infect their young. The resistance shown by adults is quite marked and is either due to an acquired immunity from primary infections that they successfully withstood or is an age resistance. Probably both factors account for this protection in adults. Winter weather prevents re-infection and pups that are kept over as breeders usually make good risks the following season. By that time they have gone through a series of parasitic infections and following the rest from reinfection during the winter, have reached an age that they are able to withstand further parasitic invasions.

Internal Parasites

Ascarids.—(*Toxocara canis, Toxascaris limbata*) (*Ascaris spp.*).—Round worms are commonly met with in all species of fur bearing animals. Because of the prevalence of this parasite on the average fox ranch it has become routine practice to treat all pups at three or four weeks of age. Raccoons are another fur bearer that appears to be heavily infested with ascarids. Adult fur bearers may tolerate a few ascarids with no apparent ill effects but in young animals the infection is responsible for many losses.

The life history is direct and in one species at least may also be transmitted from the dam to the fetus while yet in the uterus. The ova are extremely resistant to disinfectants and drying so that sanitary procedures are not as efficient here as in other parasites. During its development in the body, the ascarid larva spends part of its time in the lungs. Mass infection may cause respiratory disturbances and perhaps accounts for some of the pneumonia seen in young foxes.

Puppies with round worms become stunted and pot-bellied and the fur is dry and open. Restlessness, colicky pains, a fickle appetite, convulsions and emaciation are all common symptoms. Ascarids may occasionally be passed in the feces or be vomited from the stomach. A microscopic fecal examination is a positive diagnosis, both for puppies and adults.

Prevention depends on rigid sanitation. Portable pens, wire floored runs and the daily removal of the fecal deposits will help to keep the infection at a minimum. Board floors do not break the life cycle of the ascarid but the droppings are apparent and easily accessible so that they may be removed at frequent intervals. A blow torch may also be used to advantage on an impervious floor. Foxes should be treated as early as possible each spring.

Uncinaria stenocephala. — Hook worms are the most common parasite found in ranch raised foxes. The life history is direct by means of larvae which hatch from the ova in the feces a few hours after being deposited. These larvae require favorable temperature and a certain amount of moisture to develop. They moult several times and finally enter the body either by being swallowed with contaminated food or by burrowing through the foot pads or skin of the fox.

As a rule the clinical symptoms of hook worm infestation in pup foxes are not evident until they are two to three months of age. The coat becomes rough and wooly in appearance and pups are not well grown. Fecal deposits are dark from the parasitic enteritis and are streaked with mucus. The visible mucus membranes are anemic. Adult foxes may tolerate a certain number of hook worms but individual animals may show clinical symptoms. They eat ravenously but are thin and have dry, harsh coats. Hook worms are responsible for a heavy loss in pelting foxes. Their pelts are of far less value to those taken from healthy animals. Fecal tests will confirm the clinical diagnosis.

Wire runs and board floors are the best means of prevention. Properly constructed board floors dry off rapidly and do not retain sufficient moisture to favor development of the larvae. Grass and dirt runs are the worst from a parasitic view point. Shade and dampness are ideal for parasites. Except in clinical cases, treatment without sanitation is useless as the fox

would soon become reinfested when returned to a contaminated pen. Where foxes are kept in dirt pens it is a good plan to remove the top soil and replace with cinders or sand several times a year.

Treatment of Round and Hook Worms.—Tetrachlorothylene is the best anthelmintic for fur bearing animals. It is efficient in the treatment of both Ascarids and hook worms and is the safest remedy we have as yet. When dosing animals be sure that the capsule is swallowed and is not allowed to break in the mouth. If it does there is danger of asphyxiation from the gas inhaled. Profuse salivation, incoordination and collapse may follow. Although death seldom occurs the symptoms are pronounced and embarrassing. The best way to bring about a quick recovery is to swing the animal around by its hind legs and if necessary apply artificial respiration.

Carbontetrachloride is deadly poisonous to foxes and should never be administered. Certain commercial capsules contain this drug and mortalities frequently occur. Carbon tetrachloride is a strong gastro-intestinal irritant and causes death from severe hemorrhagic gastro enteritis. Foxes that have been poisoned do not generally die until two or three days after the administration. Puppies are the most susceptible, but an over dose will kill adults. The margin of safety of carbontetrachloride is much too small for use in fur animals.

Generaly speaking, the younger a fox is the better it is able to withstand anthelmintic treatment. Puppies are treated at three weeks of age and then again at five weeks for ascarids. Hookworm treatment is generally routine at two months and again at three. After this age the puppies appear to be upset to a greater degree and are not treated except in individual clinical cases. Adult foxes appear to have enough resistance to carry themselves over except in mass infections with hookworms. It is common practice to worm the females after the breeding season although well kept ranches do not find it necessary. Obviously the early summer worming will do the most good as it cleans out the first crop of parasites and helps to keep down infection.

Dosage for tetrachlorethylene in the different species:

Foxes—Three to five weeks old—3 minums. Two to three months—6 minums. Adults and grown puppies—12 minums.

Mink—3-5 minums.

Raccoon—5 minums to 1cc.

Animals should be fasted for 12 hours before treatment. Milk of magnesia may be used as a follow up laxative but is not necessary except in cases of indigestion or parasitic enteritis. It is good practice to keep the animals on a diet consisting largely of raw meat for the next 24 hours.

When attempting to clean up a ranch it is a good plan to place the foxes in small hospital pens 6x2x2 feet with wire-mesh bottoms. They are kept here 10 days and treated twice before being returned to their pens. During this period the pens may be thoroughly cleaned and disinfected so that after the animals are freed of parasites they will be returned to clean pens. It is useless to treat parasitic animals and keep them in contaminated runs as they would soon acquire a second infection.

Verminous Bronchitis.—Lung worm infestation and the consequent broncho-pneumonia, is the most common cause of death in ranch-bred foxes. While less spectacular than some epizootics, its insidious nature and the widespread areas affected make this a serious disease of foxes. In many localities the infection has become so extensive that ranchers must either control the parasite or be forced out of business.

Two species of lung worm infect foxes, *Eucoleus aerophilus* and *Crenosoma decoratum*. The latter is found in Europe but is not met with in America except in a few localities on Prince Edward Island and in the northern New England States. Unlike the Crenosoma, the Eucoleus does not belong to the Metastrongylidae or true lungworm family. It is a member of the subfamily Capillarinae and is closely related to the Trichuridae. Further remarks on the treatment and prevention will be confined to the common species—*Eucoleus aerophilus*.

Life History.—Although it is not defi-

nitely worked out, the life cycle is assumed to be similar to that of closely related species of which the life cycles are known. Recent investigations tend to confirm the following as correct. The adult parasites inhabit the lungs, trachea, and bronchi. The eggs are laid here and work up the trachea to be swallowed and passed out with the droppings. The ova are lemon-brown in colour, thick shelled, and characteristically "Chinese lantern-shaped" with opercular plugs at each end. After a period of development on the ground, under required conditions of moisture and temperature, embryos are formed but do not hatch. The developed ova are taken up by the fox and swallowed with contaminated food. The larva is released and migrates through the body to its location in the lungs.

Symptoms.—Lung worm infection is a disease found on established ranches and may exist for some time before it is recognized. Ranches that are started on new ground have little evident trouble for a time. Adult foxes may harbor lung worms and yet show no apparent ill effects. The parasite spreads rapidly and within three to five years several infections may develop in the young animals. Puppies do not appear to have an immunity or age resistance that adults acquire. Losses in the puppy crop may be so great that one would almost suspect a contagious disease. Cold weather prevents reinfection, and affected foxes always show improvement during the winter.

A diagnosis is comparatively easy in clinical cases. Foxes exhibit a soft loose cough and a peculiar rattling sound in the trachea. A stethoscope will demonstrate the bronchial rales and help to pick out the affected cases. The excitement of handling causes a shortness of breath, exhaustion, and possible collapse. The eye becomes sunken in appearance and mucus collects in the inner canthus. Progressive emaciation, weakness, and a harsh dry pelt are prominent in the last stages. Secondary pneumonia is a common sequence and is usually the direct cause of death. Lightly infected foxes may be detected by a microscopic examination of the feces.

Autopsy.—The carcass is usually in poor condition, but the degree of health that may be maintained is surprising. The trachea and bronchi have a thick catarrhal exudate. The lung worms are white and thread-like but are not easily seen unless the tenacious exudate is scraped away. They appear spirally coiled, like a tiny cork screw, on the mucus membrane. A smear of the mucus, examined under the low-power microscope will reveal the characteristic capillarid egg. The lung tissue is often discolored and may contain small fibrous nodules when pressed between the fingers. The post-mortem picture depends upon the amount and character of the secondary broncho-pneumonia that is usually present.

Treatment.—It is doubtful if the ordinary lung worm infection alone would cause serious trouble to the fox. However, their continual irritation and resulting injury to the mucosa weakens the lungs and leads to secondary bacterial infections of pneumonia and bronchitis which are the direct cause of death. A hemolytic streptococcus accompanied by staphlococcus are the predominant organisms found on bacteriological examination and apparently are responsible for the infection. Autogenous bacterins containing these two organisms made up for each ranch are beneficial in treatment and prevention.

Bacterins clear up the catarrh and lessen the danger of pneumonia so that the fox is able to breathe properly and may be tided over until pelted. Of course it will not eliminate the lung worms, but if pups are kept healthy until they are old enough to have developed some resistance they are generally in good condition by spring and show no further ill effects. Fox pups that are known to have lung worms, demonstrated by fecal test, should be given several injections of bacterin during the year as a preventive. Clinical cases may be treated with repeated small doses until relieved. After a few injections it is surprising how a sick fox will brighten up and its appetite increase. Affected foxes soon breathe easily, increase in weight, and grow good pelts. To prevent reinfection foxes should be placed

in wire or board-floored pens during and after treatment.

The tracheal swab is an instrument used to brush out the parasite and mucous. The operation is spectacular but it is questionable whether it does more harm or good. The stiff bristle brush injures the mucosa and can reach only to the bifurcation of the trachea so that the parasites removed are few in comparison to those left in the deeper recesses of the lung. There is always a real danger that foxes may collapse and die from lack of air following the excitement of forcible handling. Needless to say it is wise to warn the owner before operating and prepare him in case of accident.

Prevention.—Puppies that are raised on properly constructed board floors or wire mesh runs, both of which are built some two feet above the ground, will not develop lung worms even when born to infected parents. Wire floors with cat walks keep the foxes from contacting the droppings but have the disadvantage of being hard on the feet and fur. The wire will not support a man's weight and it is difficult to catch the foxes. Board floors are equally efficient and have neither of these objections. Being off the ground the floor dries quickly and does not retain sufficient moisture to favor development of the lung worm egg. Fecal deposits soon dry and may be conventiently swept out with a stable broom.

Capillaria plica.—The bladder worm is closely related to the lung worm but is found in the bladder. It is similar in appearance to the Eucoleus but is shorter and much finer. Capillaria are found on the mucosa of the bladder. They cause cystitis and hemorrhage. The eggs are passed in the urine and may be found on occasional fecal tests because of contamination. On autopsy the bladder wall is noted to be thickened and when opened has raised areas and petichial hemorrhages on the mucosa. The parasite is white and thread-like but fine and almost transparent. It may be overlooked easily in a hasty post-mortem examination. Blood stained urine is diagnostic in the living animal and may be confirmed by a microscopic examination of the urine. The ova resemble lung worm eggs but are smaller and gray or colorless in comparison to the lemon-brown shade of the Eucoleus.

Trichuris vulpis.—Whip worms are occasionally found in the ceca of foxes when autopsied. It is questionable whether they do any harm. Trichuris ova are similar in shape and color to lung worm eggs and may be confused with Eucoleus at first examination. They are a little larger in size and somewhat different at the base of the opercular plugs. The adult parasite is similar to the same species found in the domestic dog. Hexylresorcinol crystaloids are recommended for treatment of both whip and bladder worms. Caprikol and urotropin are also indicated for bladder worms, but treatment is not likely to be successful, due to the inaccessible location of the parasites.

Capillaria plica in foxes may be prevented by placing them on board floors or wire mesh runs. It is likely that foxes raised on either type of floor will be free from Trichuris also.

Construction Floors. — Properly constructed board floors will prevent lung worm infection in puppies even when born to infected parents. Hook worms are likewise unable to develop because of the lack of moisture. Round worms, however, have a much more resistant egg shell and become infective on hard floors. It has been proved that foxes do equally as well when kept in small runs about 20x8 feet as they do in the old style large pens.

Board floored runs should be built with a decided slope and the lumber laid lengthwise of the slope. The drop should be six inches in 20 feet and the boards straight edged and placed close together. Warping and shrinkage produces cracks which assist in perfect drainage. The floor should be constructed so as to be at least 18 inches to 2 feet above the ground. This also assists in rapid drying after a rain because of the circulation of air under the floor. Floors that are built too close to the ground will absorb enough moisture to allow parasite ova to develop. Fecal deposits dry

quickly and may be conveniently swept out with a stable broom.

Wire floored runs are also used to prevent parasites. Foxes are raised on wire bottomed pens so that the droppings go through the mesh and the foxes are not able to contact infection. The wire is heavy gauge, 1-inch mesh and should also be built some two feet above the ground. While wire floors do prevent all parasites with a direct life cycle they are rather hard on the foxes. Sore feet and rubbed fur are often seen in foxes kept for long periods on wire mesh. Most pens are built with a so-called "cat walk" which is a 12-inch board platform around the four sides of the pen. The foxes stay on the board and seldom use the wire unless alarmed. Another objection to wire pens is that they will not support a man and the foxes are hard to catch.

Physaloptera sp.—This parasite locates in the stomach and is found attached to the mucosa. The life cycle requires an intermediate host and the immature form is found in beetles. Insect eating animals such as the raccoon, badger, skunk and opossum are the fur animals usually affected. Large numbers are frequently found on autopsy of wild animals. In captivity the Physaloptera may cause anemia and other symptoms of parasitism. The parasite is a large stout form closely resembling an ascarid and would be mistaken for such unless specimens were cleared and examined microscopically. The ova are large and oval-shaped and contain larvae when laid. Treatment recommended is tetrachlorethylene but carbon tetrachloride is said to be more efficient although the dose must be carefully regulated to avoid mortalities.

Dioctophyme renalis.—In certain localities the kidney worm has been found in 50% of the wild mink examined. The intermediate form is found in fish. Kidney worms seldom cause trouble in ranch bred animals except on small ranches where raw fish is fed. The adult parasite is from four to 16 inches in length, about the thickness of a lead pencil and is blood red in color. The male is always much smaller than the female. The Dioctophyme is generally found in the kidney, but occasionally in the peritoneal and thoracic cavities. The egg is large and oval and has a thick pitted capsule. Generally only one kidney is affected, appearing as a large cyst containing from one to six parasites. The renal tissue is completely destroyed, leaving a thin-walled cyst of the capsule which contains the coiled up parasites. A boney deposit is often present at the hylus. The healthy kidney is always greatly enlarged due to compensatory hypertrophy. There is no medical treatment but it might be possible to remove the cyst surgically by laparotomy. Well developed cases may be diagnosed by palpation of the abdominal wall.

Cestodes (Diphyllobothrium latum, Taenia spp.).—Tape worms all require an intermediate host and as a rule are not considered common parasites of ranch raised animals. Where small rodents and raw fish are fed to fur bearers they may have tapeworms. The practice of feeding frozen fish in the winter is a dangerous one because the foxes may obtain the intermediate form of the *Diphyllobothrium latum*. When a diagnosis of this parasite has been made it would be well to advise the rancher to boil the remainder of the suspected fish before feeding. *Taenia pisiformis* may be found on ranches that feed rabbits.

Treatment — Arecoline hydrobromide 1/20-1/10 grain per os and remove the source of infection. The fox should be treated only after being starved for twelve hours.

Trematodes.—Many different species of flukes are found on examination of wild caught fur bearers. They also require an intermediate host and thus are seldom considered of importance in ranch bred animals. Artificial rations as a rule do not contain the immature forms. Tetrachlorethylene is recommended for treatment of intestinal forms. However, there is no specific medication and treatment has been far from satisfactory.

Isospora, Eimeria. — Coccidia are frequently found when making fecal examinations for intestinal parasitism in fur bearing animals. Generally speaking they are considered of no clinical significance unless found in tremendous numbers. Out-

breaks of coccidiosis have been reported in wet seasons on ranches with dirt floors. The puppies develop a severe hemorrhagic enteritis and the mortality is high. There is no treatment except careful and nourishing diet. Prevention consists in placing the foxes on board floors or wire mesh runs. Bloody diarrhea is also a symptom of paratyphoid and this disease should be kept in mind when making a diagnosis.

External Parasites

Ear Mites (Otodectes cynotis). — Ear Mites are prevalent on every fox ranch and require routine treatment to keep down the infection. Foxes with ear canker will be noticed to repeatedly shake the head and are continually scratching at the ears with their hind feet. Bacterial infection may follow or accompany ear mites. Cases of otitis interna show severe symptoms. Foxes will carry the affected ear to one side and may show nervous involvement. Whenever convulsions are a symptom of disease it is wise to examine the ears. The canal is filled with wax and discharge that cakes and forms crust formations. The mite will be found immediately on examining a smear with the microscope.

Treatment—A number of antiseptic applications have been used in fox practice but the best formulae is the following:

Balsam of Peru
Alcohol
Ether
Glycerine aa equal parts.

The ether loosens the wax and crusts and allows the medication to penetrate all parts of the ear canal. The glycerine is an emolient and the balsam of Peru the active ingredient to kill the mites. The alcohol is used only to dissolve the balsam of Peru. The ether evaporates and so does the alcohol leaving the glycerine which soothes the inflamed ear and finally also evaporates, leaving the balsam of Peru in a thin gummy residue. This will remain in the ear some two weeks after being applied. The best way to treat a large number of animals is to use an ordinary oil can and protect the tip with a section of rubber tubing. Each animal is caught and both ears given a generous douche by a squirt from the oil can. It is best not to clean out the ears at first as this tends to spread the mites to the fur and favors reinfection. A second treatment should be given in 10 days. The ear may be wiped out with cotton swabs at this time. Early spring treatment will go a long way toward keeping the infection at a minimum. The mites are fewest in numbers then and should be killed before the warm weather favors their rapid increase.

Fleas (Ctenocephalides canis). — Fleas are a constant source of irritation to foxes and other fur bearing animals. The symptoms are self evident but it is remarkable how they seem to attack the pups and weaker animals in the greatest numbers. Foxes with fleas will not have the same glossy pelts that come from healthy animals. When examining animals for fleas always look under the chin, around the head, between the shoulders and at the base of the tail. If fleas are not seen running through the hair feel the skin with the finger tips. Coarse gritty debris is evidence of infestation. Foxes will be scratching and biting and may rub the back under the kennels.

The most important item in considering treatment is to remember that fleas reproduce a generation every 10 days and that no application will destroy the nits and eggs. Further more fleas breed not on the body but in cracks and dust of the kennels. A double treatment with a 10 day interval including both the animal and sleeping quarters will go a long way toward eliminating fleas from a ranch. Derris powder is the only flea powder that is efficient. Pyrethrum only stuns the fleas temporarily and if not combed out they will soon be as active as before. Fly and mosquito sprays incorporating specially refined kerosene and derris powder or pyrethrum extract are really efficient and actually kill fleas. Apply with a spray and hold the gun far enough away so that the preparation forms a fine mist on the fur. If held too close or applied direct to the skin it will burn and scurf. Derris powder and commercial fly sprays are the best agents to control fleas. However, the treatment must be thorough and implies general ranch sanitation.

Lice (Trichodectes spp.).—Lice are sometimes found on fur bearing animals. The life history is completed on the host. The eggs are glued to the hair and have a protective covering that stops the action of disinfectant. The same treatment used to kill fleas will destroy lice and should be repeated every 10 days to be sure that the newly hatched lice will be killed. Severe cases may require a creolin bath.

Sarcoptic Mange (Sarcoptes scabiei).—Scabies is a rare disease in wild animals but a few authentic cases have been recorded in silver foxes. Mange in rabbits is fairly common and is caused by the Sarcoptic and Notoedres mites.

Lesions may appear on any part of the body but usually commence on the legs and head. The affected parts are denuded of hair and the skin is gray, wrinkled and scaly. The skin is thickened and feels like parchment or tanned leather. The animals scratch and bite at the parts and because of the irritation the skin may become sore and cracked. Diagnosis should be confirmed by a microscopic examination of a skin scraping. However, it is sometimes difficult to demonstrate the sarcoptic mite and a diagnosis of scabies is warranted from the clinical picture and history. As a rule, foxes and other fur bearing animals do not have eczema and any skin condition should be carefully investigated for mange mites.

Treatment is the same as in dogs and consists of sulphur, balsam of Peru and other mange applications. The fur should be clipped away from the affected parts. First bathe with soft soap and water then apply the parasiticide. Because it destroys the pelt, mange once established would be a serious disease.

Following treatment, the kennel and run should also be thoroughly cleaned and disinfected. Where only one or two animals are affected it might be wise to destroy them rather than risk the spread of mange to other animals. The owner should be warned of this possibility before treatment is commenced. Cases respond well to treatment.

Fitch and ferrets commonly have sarcoptic mange but the mite tends to localize in the feet. This condition is known as "foot-rot." The foot pads and skin between the toes is affected. The lesions are pronounced and the parts swollen and covered with scab formations. When these scabs are taken off the mite is easily demonstrated on a skin scraping. Treatment is the same as for body mange. The scabs should be soaked off with oily preparations and the feet dipped at frequent intervals until recovered.

Myiasis (Wohlfahrtia vigil, Lucilia caesar).—Young fur bearing animals occasionally become fly blown with the larvae of the so-called flesh fly. Both fox puppies and mink kits have been affected on the same ranch. The larvae enter the unbroken skin and burrow under the subcutaneous tissue. The lesions are found in the anal and abdominal regions. Nodules are formed with a small opening, and the hair around it is moist from the exudations. The larvae should be removed by squeezing the enlargement or by being picked out with small forceps. Antiseptics may then be applied until the lesion is healed. Myiasis is a disgusting disease to say the least and ranchers should be warned of the possibilities of infection and advised on treatment.

Dermestes.—Larvae of the Dermestes beetles have recently been reported to be responsible for disease in mink kits. The beetles gain access to the nest box and the larvae when hatched may feed upon the young mink. Treatment is to clean out the nest and sprinkle the bedding with derris powder.

Ticks.—Ticks are occasionally found on trapped wild minks and may occur on rabbits. They are generally found inside the ears and around the head. Ticks are not usually a problem on fur farms proper but are of interest when found on wild caught animals. When found to be present the ticks should not be pulled off forcibly as the head is imbedded in the skin and would break off and cause an abscess. Castor oil, iodine or ether will kill them when applied several times.

There are many other forms of parasites found in fur bearing animals but their occasional recording from the wild caught

animal is more of parasitological than veterinary interest.

Infectious Diseases

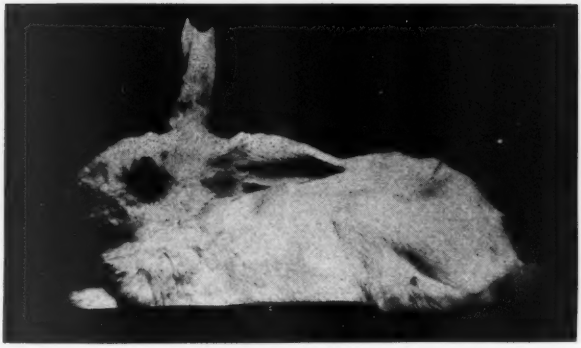
The reaction of wild animals to disease is entirely different from that of domestic species. Symptoms are often severe but are so varied that one must consider carefully the history and general average picture when attempting a diagnosis. A fox or mink with ear mites or indigestion may show all the classical symptoms of several infectious diseases. Wild animals have not been exposed to repeated infections and appear to have no resistance to infectious disease. Death may be so rapid that few lesions have developed and autopsies are unsatisfactory and often remarkable only for the absence of expected lesions. It is sometimes difficult to satisfy oneself as to what may have been the real cause of death. The symptoms listed for any one disease should not be considered as constant. They indicate the average symptoms that are generally predominant and perhaps might not be applied to certain individuals in the outbreak. The history and characteristics of the spread of infection are important and every angle should be considered before a diagnosis is attempted. Whenever possible, laboratory assistance should be relied on to confirm the diagnosis. Virus diseases are the most confusing and unfortunately in these laboratory procedures are generally negative.

It is to be remembered that a disease may be self limiting. In no outbreak would all the exposed animals contract the infection. There is always a percentage that will remain healthy when exposed to an infectious disease. Mortality varies in different diseases and in outbreaks of the same disease. As a rule young animals are more susceptable than adults but losses depend on a vast number of factors centering on direct contact with the infection and lowered natural resistance. The time of the year and age of animals also influences the percentage of mortality. Heavy parasitic infestations and deficient nutrition are both important factors in reducing resistance to disease. Should infection break out on a ranch where the animals are in poor condition from parasites, bad feeding and unsanitary ranch methods, the losses will be heavier than if the same disease had broken out on a well kept ranch. Fox ranches with adults harboring lung worms are liable to an outbreak of virulent infectious pneumonia in the puppies.

When infectious disease breaks out, the most important step to keep down losses is to immediately isolate all sick and contact animals. To break the spread of infection the animals in pens immediately next to and on all sides of the sick animal should be taken out. Isolated animals should be placed in small isolation pens of a portable design and kept well away from the main ranch. For foxes, a suitable pen is one 3x8x3 feet with a wire-mesh bottom and weather proof shelf. These pens are easily cleaned and disinfected and may be moved to any desired location. They are placed on posts 2 feet above the ground. Isolated animals should be watched carefully for further development. If the disease is infectious there is a better chance to keep the losses confined to the isolated animals and prevent the serious mortality that would otherwise occur had the disease been allowed to spread in the ranch proper.

In wide spread infections, complete isolation as outlined would not be feasible. Where biologics are of no value the disease will have to run its course and generally subsides in a few weeks. Sanitary measures should be rigidly enforced and everything possible done to keep the losses at a minimum. Strict sanitation must be observed to prevent contamination of the feed and to be careful to disinfect mouth gags, tongs and carrying cases. This is important when shifting animals as if one diseased case is handled there is a possibility of spreading infection to all the others moved thereafter. Feed pans and pens are better left dirty than risking the spread of infection by half-hearted attempts at cleaning. Healthy foxes should be handled as little as possible and fed and watered through the wire. Attendants should enter the pens only when absolutely necessary as infection is present in the droppings and might be spread from

pen to pen by manure that clings to the shoes. A roasting pan full of sawdust that is kept wet with strong disinfectant may be placed at the ranch gate if necessary in front of each pen. Don't excite the animals by unnecessary handling or strange noises as they are subject to convulsions in most diseases and if excited might go into a fit with disastrous results.



Myxomatosis of Rabbit
Note excessive edema of muzzle and ears.

Warn the rancher against bringing sick animals near the cook house. It is from this course that a good deal of infection is spread throughout the ranch. Attendants often bring sick animals into the cook house to have them handy for medication and to keep them warm. This is common practice and the contamination of feed often accounts for a wide spread infection and sudden outbreak of new cases in various parts of the ranch.

Pens and kennels that have contained sick animals should be sprayed with disinfectant solution. Kennels and nest boxes should receive special attention; these pens should be left vacant as long as possible.

Fur farms are usually established well away from towns and are in themselves isolation units. There is little or no movements of live stock, as compared to domestic animals. Each animal is kept in a separate pen and the chances of spreading infection are not to be compared with other species. Outbreaks of disease may frequently be traced to the purchase of new stock or may follow a live animal show. Fur farms should have isolation units and all new animals kept in separate pens for at least six weeks observation before being placed in the main ranch. This rule holds true when animals have been sent to a show. When they are brought back they should be treated as possible disease carriers for several weeks before they are admitted to the ranch proper.

Infectious Lobar Pneumonia of Foxes

This disease always occurs on ranches that have had trouble with lung worms. A hemolytic streptococcus is often associated with the broncho-pneumonia that accompanies lung worm infestation. Apparently adult foxes have considerable resistance to the organism but puppies may develop septicaemia and losses in them may be great. On autopsy, a virulent hemolytic streptococcus can be isolated in pure culture from the lungs. Stained smears of the bloody serum that oozes from the surface of the lung tissue, will be swarming with the typical gram-positive, short-chain streptococci.

Course and Characteristics.—Only pup foxes will be attacked. Sometimes an entire litter will be wiped out while the female in the same pen remains healthy. Cases appear suddenly but can generally be traced to one or two pens from whence the infection has been spread to other parts of the ranch. This history is usually that one or two puppies have died but the owner had not become alarmed until the infection appeared in several adjacent pens.

Symptoms.—Pups may be picked up dead without showing any previous symptoms. Usually pups in excellent health will be noticed to miss a feed. In a few hours they stand about with heaving sides and are in apparent distress. The respirations are shallow and labored and become aggravated when the pups are chased around the pen before being caught. Bloody froth appears at the nose and the pup rapidly becomes weaker and dies in a comatose condition. Most animals die within 24

hours after showing the first symptoms but a few may last from two to seven days.

Autopsy.—The carcass is in excellent condition and when elevated by the hind legs, bloody froth drips from the nose. On opening the thoracic cavity, bloody wine-red fluid may be present. The entire lung tissue is swollen and congested. The color is dark red from the engorged blood—red hepatization. Serum oozes from the cut surface and the thoracic lymph glands are congested. There are no lesions of disease outside the thoracic cavity. The characteristic autopsy is the acutely congested lung tissue involving all the lobes.

Characteristic appearance of fox affected with paratyphoid.

Treatment.—Medicinal treatment is not successful due to the acute nature of the disease. Isolation of the sick and contact puppies is immediately advisable. Autogenous bacterins appear to be specific and should be made from a strain that has been isolated from the ranch on which the outbreak has occurred. When called in to treat an outbreak of this type the veterinarian should send a fresh carcass to the nearest laboratory to confirm his diagnosis and to have an autogenous bacterin prepared for use on the remaining puppies.

Fox Paratyphoid

Paratyphoid is an infectious disease caused by a paratyphoid organism. It is essentially met with in fox pups under one year but some cases do occur in adults. The prominent symptoms are diarrhea, inappetence, hemorrhagic enteritis, loss of weight, weakness, and occasionally convulsions. The course of the disease is several weeks duration and losses in some epizootics have reached 60% of the puppy crop. The usual picture does not include pneumonia, but respiratory involvement may occasionally be met with in winter outbreaks. Paratyphoid has been confused with coccidiosis because of the enteritis that is a symptom of both diseases. A careful observation should be made before a diagnosis is warranted.

Autopsy findings vary somewhat, but the most constant lesion is a tremendously enlarged spleen. It is dark in color and so engorged with blood that the contents may be washed away with water. Inflammation of the intestinal tract varies from acute hemorrhagic to chronic catarrhal in type. The adjacent lymph glands are involved. The upper respiratory tract is usually normal except in rare outbreaks that may have developed pneumonia complications. The carcass is emaciated and the eye markedly sunken.

Treatment.—Autogenous bacterins produce excellent results in the treatment of this disease. There are several strains of fox paratyphoid organisms and as these do not cross-immunize, a bacterin should be prepared from the strain that is responsible for each outbreak. Sanitary measures and isolation of sick animals is also advisable.

Food Poisoning

This disease is caused by decomposed or contaminated food. Putrid meal and mixed cereal and meat rations that have spoiled are responsible. Certain types of moldy

bread and cereal have also been incriminated. Putrid fish produces one of the severest types of the disease. The actual cause has not yet been fully determined. There is a wide variation in the susceptibility of individual animals. In some cases only one or two foxes will be affected, but in others a number of animals may show symptoms of the disease.

Generally the first symptom is to find a fox or two dead. It has been noted that most cases of fatal food poisoning have occurred in animals that were apparently in good condition. When questioned about the condition of the feed, the rancher will generally recall that the last batch of feed might have been spoiled or that he has fed putrid fish or moldy bread. Autopsy findings are rather confusing and we have no definite post-mortem picture. Gastritis and enteritis may be present and the liver somewhat congested. The kidneys are often acutely inflamed and there may be petechial hemorrhages in the lungs and on the heartmuscle.

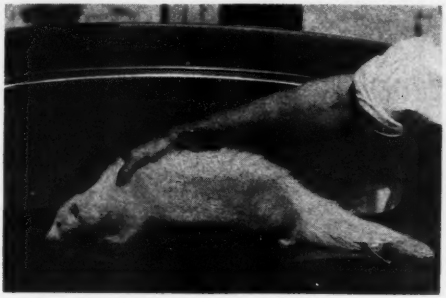
Treatment.—The course of the disease is so acute that treatment is seldom attempted. If the case is observed early the stomach could be emptied with apomorphine and intestinal antiseptics prescribed. Any questionable food should be disposed of and all feed pans, refrigerator and water pans carefully disinfected. A general clean up made and advice on sanitation should be given.

Tuberculosis

Occasional cases of this disease have been recorded in the fox and raccoon. The strain of tuberculosis, for those that have been worked out, has always been bovine. It is supposed that the infection was acquired from eating tuberculous meat or drinking milk from an infected cow. The disease is seldom diagnosed in the live animal and is only picked up during routine autopsies. The lesions are not as characteristic as tuberculosis in domestic animals. The best method of confirming a diagnosis when the acid fast organisms can not be demonstrated easily, is to inject guinea pigs with an emulsion of the tubercular lesions. Laboratory animals are more susceptible and the acute lesions are characteristic.

Infectious Conjunctivitis

Silver foxes that are being kept on straw for show purposes or to prevent rubbing often develop severe conjunctivitis. The cause has been attributed to be the



A "Platinum Blonde" Skunk

pollen and dust arising from the straw bedding. Straphlococcus organisms may easily be demonstrated by examining stained smears and it is likely that this organism is directly responsible. The disease tends to spread to other foxes if they are in close contact. The symptoms are conjunctivitis and later a purulent discharge that cakes around the eyes and sometimes closes the eyelids. The discharge may cause the fur in these locations to fall out. The condition tends to persist unless treated.

Treatment.—Wash the eyes with antiseptic solution and apply yellow oxide of mercury or other opthalmic ointment. Persistent treatment is necessary and may have to be carried on for some time. Silver nitrate and other astringents may be indicated. An autogenous bacterin from the staphlococcus organism causing the disease may be used and often brings about recovery where medicine has failed. The entire ranch may be given several injections to stop the spread of the disease.

Acknowledgement

The material for this paper was obtained mainly from practical observation of fur bearing animals while the writer was associated with Dr. Ronald G. Law, Director, Experimental Fur Farm, Kirkfield, Ontario. Many of the thoughts expressed are those already voiced by Doctor Law in his excellent writings on this subject.

BABY RACCOONS

Raccoon Raising

By EARL F. GRAVES,
Madison, Wisconsin

Introduction

There is a constant demand for information on raising raccoons. Presumably there are many prospective 'coon farmers. For many years 'coon hunting has provided an interesting pastime for sportsmen. The pelts have been sought by trappers and while not a high priced skin, have been a source of income to those interested in trapping or producing the animals.

The fur farming industry has long been a fertile field for wild enthusiasm and I wish to strike a note of caution. Raccoon raising can not be classed as a money making business, but, never-the-less, it has been practiced for a long time. Where inexpensive feed is available in sufficient quantities it may be possible to produce the animals at a profit.

The raccoon is an interesting animal and so sought after by hunters that it is somewhat surprising that there are any surviving in our woods today. As a matter of fact their scarcity has become noticeable in many sections where they were once plentiful.

In rearing raccoons it must be recognized that food is not the only problem entering into consideration but breeding and selection are extremely important.

Parasites and disease take their toll and many young are destroyed by their mothers.

Description and Habits of Raccoon

The scientific name of the raccoon is *Procyon lotor*. The natural habitat is temperate North America. The size varies from 12 to 18 inches in height and 15 to 24 inches in length. The tail is 10 to 14 inches long and ringed with bands of dark fur. Body weights and measurements naturally vary so there may be considerable difference in individuals. The range in weight is from a few pounds to 30 pounds or more for mature animals.

The body is stout, with a rather wide head which tapers to a sensitive nose. Small, black beady eyes. Upright rounded ears, constantly in a listening attitude, are the rule. The fore legs are a little shorter than the hind legs in appearance, and the animal walks with a decided hump in the back. The feet are not covered with hair or fur. The toes are well adapted for grasping the food which the animal likes to immerse in water and clean before eating.

The underparts of the body are light brown or grayish. Across the face is a dark band that gives the animal the appearance of wearing a mask. The length of life depends upon the general care which the animal receives, individuals may live for many years in captivity. They thrive and breed well under controlled conditions.

Selection of a Location

There is nothing of special importance to bear in mind when selecting a ranch location. It is not necessary to seek isolation. Any back yard that is protected from dogs may be suitable for a few animals. Of course, if any considerable number of animals was contemplated, sufficient room should be available.

A gentle, sloping, well drained terrane is always the most satisfactory. A southern exposure permits the sun to shine upon the pens but during the summer suitable shade is necessary and heat should be avoided. It should be borne in mind that sandy soils make ideal areas for fleas. Protection from prevailing winds in the winter is also a necessity.

It is always well to investigate city and village ordinances before locating animals in or near a town. Some cities have, and others may pass, ordinances prohibiting the keeping of certain types of live stock within certain zones.

The convenience of electricity and water should not be overlooked. Both are great aids in labor saving,—electricity to run food grinders and piped water to eliminate much back breaking toil.

Nearness to an ample, inexpensive food supply is extremely important. Every dollar spent on food transportation must be charged against production costs and it must be remembered that the Raccoon is a low priced pelt. Last, but by no means least,

one should study the matter of a market. If one has a considerable quantity of good quality fur which is uniform in color and texture, there is always a demand for it. If it has been produced without too much overhead expense, there may be an opportunity for profit. The boom days wherein high prices were obtainable for mediocre stock are gone and better business methods must supersede wild enthusiasm and carelessness.

A very common question which is asked concerns the relative differences in value between the black and gray raccoons. I quote the following from the letter of one of the world's leading fur auction houses, dated June 17th, 1935.

"For the black raccoon without any character, the demand is rather poor, especially if it has reddish or rusty cast. The dark raccoon that are in demand and that bring the highest prices are those that have the gray running through them. What the actual difference in value is between the two is very difficult to estimate, as quantities produced are not large enough to bring a steady demand. While on sale we may have a number of buyers for the article who are anxious for a quantity and will be willing to pay high prices to obtain them, there are other times when the demand is so limited that only regular prices of average goods are realized.

"In our last auction the dark skins with gray character of heavy quality, realized up to $10.00 for the extra large size. The absolutely black skins of the same quality and size brought between $5.00 and $6.00."

It would appear that the real value of black raccoon lie in the use of them to improve the color of the grays. As the dark gray is most in demand it would be well to have both the gray and black animals so as to obtain the darker grays by crossing.

The overhead expense of a fur farm must be as carefully considered as that of any business. Such items as salary, interest on investment, taxes, licenses, food costs, equipment, maintenance and depreciation are all very important in the animal business.

The man who has only one or two animals as an amateur's hobby or avocation usually does not consider such items. Persons not trained in agriculture or without animal husbandry experience should realize that the raising of raccoon, or other animals, is really a serious business, when properly conducted. Caution is again advised against over-enthusiasm, a fault which has been associated with the rearing of fur bearing stock and its sale. Many persons are not equipped with the endless patience and kindly temperament required to handle live stock or the knowledge and understanding so necessary for the animal's welfare.

The Pens

In visiting raccoon farms, one is struck by the wide difference in cages used to restrain the stock. After all, so long as the pens serve their purpose, that may be sufficient; but often the pens are thrown together with materials already, or near,

Dr. Earl F. Graves

at hand. This is, at time of construction, usually the cheapest but in the end the most expensive. The pens shown in the illustrations are an excellent type. It is a type of pen which is very simple in design and construction and economical to build. Feeding and watering are quickly accomplished and the pen is easy to keep clean. There is a tendency for the animals to place their droppings indiscriminately about a pen of this type. A sand box which lessens the nuisance may be used.

The type "A" pen is designed to hold three females and a male during the winter and breeding period. When whelping time comes it is meant for but one female and her young up until weaning.

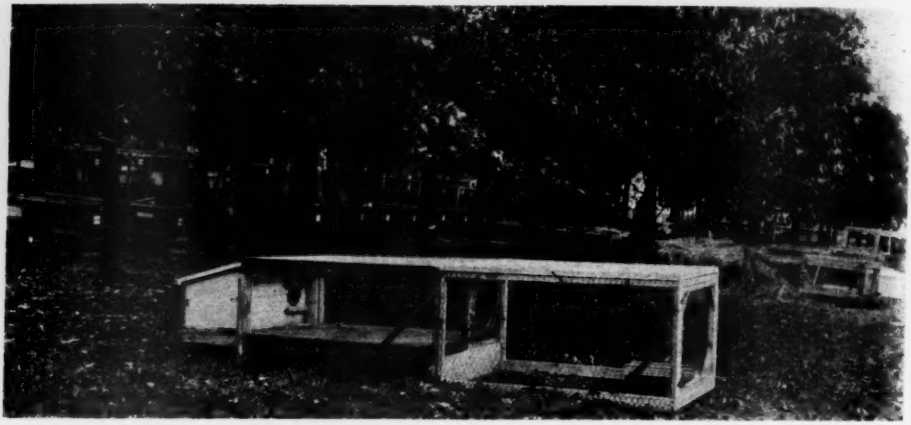
The type "A" male's pen is similar to the large pen but a little smaller in size.

The kennels are also easily constructed and are very simple in construction. It is admitted that certain refinements are possible, but they may be added according to individual desires and means. As the pen and kennel stands it is a very practical one and readily moved about which is desirable.

Except in very cold climates the double walled kennels are not necessary. The door slide is a good feature.

Raccoon Mating

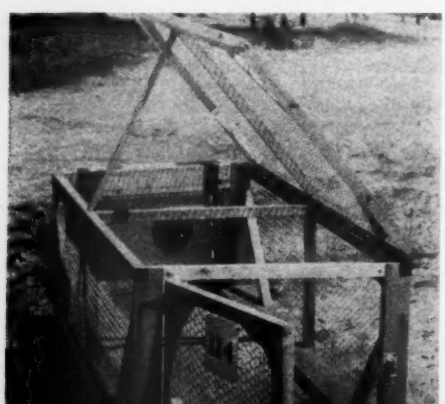
It is desirable to mate only the best individuals but in breeding wild or semi-wild stock one finds that he can not always follow the ideal. Many animals appear to have their "likes" and "dislikes" and it is not always possible to make the desired crosses. Good sound judgment must be used and the ideal approached as nearly as is practical in individual cases. Breeders should not be afraid to breed closely as it is by such methods that all classes of domestic stock have been built up from small beginnings into standard recognized breeds.



View of pen for female raccoon and young.

It is common practice to place one male with three females in the fall and let them winter together until the young begin to come in the spring. The mature stock is then separated and placed in individual pens. Pens should be far enough apart to prevent the animals from fighting through the wire. This method is a practical one. One male may serve more than three females but the maximum number has not been ascertained.

The raccoon becomes sexually mature in from nine to twelve months. The breeding season is late winter and early spring. January, February and March are the months in which the most matings occur. Some females show that they are approaching the estrus period for as long as three weeks but the period appears to extend for about a week. Gestation is from 63 to 66 days. The young may arrive from early March to late May or even in June. The number in a litter may vary from one to seven, the average, perhaps, being near four. Some individuals will produce two litters a year if the first born are removed while still quite small. Late, backward springs have a tendency to retard mating.



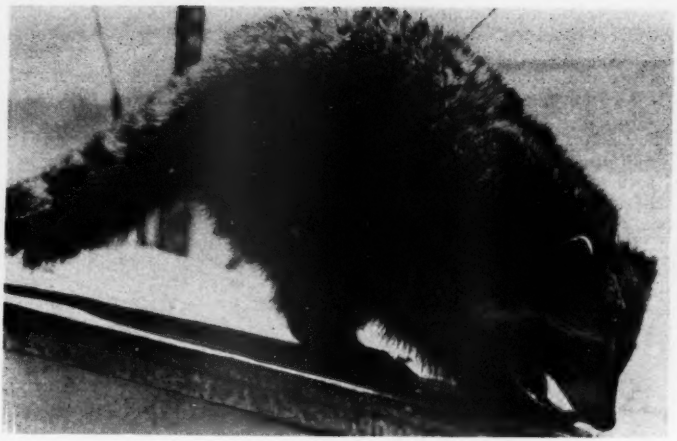
End view of pen for male raccoon.

Raccoon Feeding

Raccoons are practically omnivorous and they enjoy, and require a variety of foods. The materials required are simple and must obviously consist of those articles generally known as food materials. Meat should be utilized in the raw state. The viscera of animals should be used and not discarded. Horse meat, beef, pork, fish or poultry may be used. That which is the most economical should be utilized. Any changes in rations should be brought about gradually for abrupt changes frequently induce indigestion, often with fatal results. Fish, when economically practical, make a good food and may be fed entire or ground. Carp can be utilized but it is advisable to scale them first, if the scales are large, as they interfere with the swallowing of the food. This is especially true with the young raccoon.

Green bone is a splendid way to utilize the bones of slaughtered animals. It furnishes calcium for growth and body maintenance. It is palatable and they like it but it spoils very readily and must be kept frozen. Edible, steamed bone meal such as may be procured from any feed store has advantages in that it keeps indefinitely any place, so long as it is dry. Steamed bone meal is a valuable source of calcium but somewhat less palatable than green bone.

Cereals may form a large portion of the ration and for this purpose, whole rolled wheat is well suited. If the cereal is cooked so as to predigest it, the animals enjoy it's taste and they also utilize



The raccoon is a most inquisitive animal.

it to better advantage. The cooking may be accomplished in an ordinary iron stock food cooker. Whole, rolled wheat cooks in from fifteen to twenty minutes. Such cooking does not harm the food.

Any of the common garden vegetables may be used but carrots make a good standard ration and they can usually be procured in quantities all year 'round. These may also be utilized raw or cooked but the cooking predigests them so that they are used by the animal's body more efficiently. Cook for thirty minutes. Such things as fruit and sweet corn are enjoyed by raccoons and need not be cooked. Greens may be added. Lettuce and cabbage when finely ground appear to be utilized but cooking three to five minutes assists the animals to digest them. A small amount of codliver oil is advisable, especially during the winter months, to pregnant females, nursing mothers and growing young. Milk is an excellent food for small and growing individuals. Many matured animals do not tolerate milk well and it often appears to be quite irritating to the intestinal tract. When such a condition is manifested by diarrhea the amount of milk in a ration should be immediately reduced. Growing pups thrive better when fed three times a day.

Common unrefined salt should be added to the food. In winter one may feed quite heavily on meat. As spring and summer approach more of the greens and vegetables may be fed and cereals increased as fall come on. Experience has taught that by keeping the long end of the ration flesh, the best results are to be procured.

The animals' droppings should be watched carefully and observed for form and the presence of mucous. An over abundance of cereal or cereal products may cause diarrhea. This may be overcome by withdrawing the cereal and increasing the amount of meat.

As fall approaches, acorns are enjoyed by the raccoons and the animals become very fat upon them in preparation for their winter hibernation. During the winter there will be many days when the stock prefer to sleep soundly. This is but natural and they should not be disturbed for feeding. The feeding may be discontinued for many days at a time. On warm days there is usually an interruption of the hibernation and they come out to eat, drink and enjoy the sun. When feeding the animals they should be closely studied for their personal requirements for the amount of feed that may suffice for one case may be quite inadequate for another. Only the amount that is eaten in a reasonable time should be put out at a time and the pans should be taken up and cleaned before the next meal. Do not let the food accumulate in the pans and pens to attract flies and decompose. Besides being a source of danger to the stock it is expensive and wasteful. It denotes a lazy, shiftless type of ranching.

If the stock is healthy, they will breed, whelp and grow to maturity and produce good fur,—providing they have the inherited characteristics for good fur production. Extremely cold weather is not essential for good fur.

Bedding

Raccoons may be bedded with straw or hay,—a good clean marsh grass make a fine bedding material. A piece of heavy burlap tacked so as to hang over the entrance of the kennel prevents the snow and rain from drifting in. Kennels should be provided with suitable holes for ventilation so that frost will not collect on the inner walls.

Keep the nests and pens scrupulously clean at all times and in constant repair. Daily looking into the kennels is a good practice,—except in bad weather.

General Handling

Animals that are early and carefully handled become very tame as a rule. One should avoid

any show of temper or irritability and constantly practice patience and deliberation. It is not necessary to make pets of each animal but it is well to have their confidence so that one can handle them when necessary.

When it is desired to transfer an animal from one pen to another a box with a sliding door will be found to be of great convenience. The box may be placed at the kennel entrance. Upon lifting the kennel lid the animal almost invariably in seeking to escape walks directly into the catching box. The door may then be dropped and the animal is taken away without the least confusion. It is almost the ideal way to make transfers.

The animals should be provided with a bit of hollow log, natural or artificial, with which to play. Four boards may be nailed together so as to form a rectangular box without ends. This is satisfactory and permits them to play and amuse themselves.

Killing

When killing raccoon for their pelts, the animals should be destroyed in as humane a way as possible. Gassing or chloroforming is not recommended. Perhaps the most humane manner is a well placed bullet. It dispatches the animal and the small hole is not detrimental to the pelt.

Skinning

Raccoon skins are prepared in an uncased manner. The skin is opened with a sharp knife from chin to tail down the median line of the belly. The hind legs are spread and the skin cut from foot to anus down the back of the hind legs. The front legs are split from foot to foot down the inside to the median line incision. The skin is removed from the carcass and the tail bone is removed.

The raccoon appears to be wearing a mask.

The pelt must be laid out and all fat and tissue carefully removed by scraping with a dull knife or a large spoon sharpened upon one edge. Hardwood sawdust is of great help in pelting, by rolling the skin in the sawdust. The sawdust sticks to the moist tissue and the skin is thus made easier to handle and work with by not being so slippery. Care should be taken not to remove the very fine layer of connective tissue immediately under the skin, or the hair follicles will be destroyed and the hair will pull out readily. The beam knife used by professional furriers is far superior for fleshing purposes to a sharpened spoon.

The skin may be stretched into a somewhat rectangular shape by tacking to boards and drying in a cool, airy place. Heat will ruin a drying pelt and hence pelts should be kept out of the sun and away from stoves. Do not use tanning agents, salt, or other materials on the raw pelts. Simply dry them.

Common Parasites

The raccoon is subject to many parasites, the most common of which are lice and fleas. These may be controlled readily by the use of derris powder liberally sprinkled throughout the fur and down next to the skin. Bedding should be burned and the kennels flamed out with a torch when attacking these parasites.

Intestinal worms are also factors to be dealt with. An animal parasitized with intestinal parasites is usually unthrifty. The fur lacks luster and in spite of a voracious appetite, the individual is likely to be poor in flesh. There may or may not be diarrhea present. More or less paralysis may be manifested. A good vermifuge is tetrachlorothylene. In the administration of tetrachlorothylene to very small animals, a word of caution is advised, as they may appear to swallow the capsule, but retain it in the back of the throat and thus be suffocated.

Nutrition

Malnutrition is of next importance. One of its most common manifestations is in the condition known as eczema. It usually manifests itself by the hair and fur coming out and eruptions on the skin which may develop into ulcers. This is more likely to occur upon the back and tail of the animal than elsewhere. A change of diet usually brings about favorable results. The addition of greens to a ration often is sufficient to effect a cure.

Rachitis is another very common disease among fur farm stock. Often cases succumb before symptoms are observed. The bones do not contain a sufficient amount of calcium to make them hard. The injury to the skeletal structure is not by any means all the damage that is accomplished. The entire body system tends to break down and normal functioning is impossible. Outwardly, an animal may appear fat and healthy, but his bones

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Explanation: a = abstract, b = obituary, c = case report, and d = discussion or demonstration

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may be so softened that they may be tied into a knot without breaking them.

Plenty of good wholesome food and lots of bone meal and cod liver oil obviate this condition. The cod liver oil should be mixed with an equal quantity of lime water into a thick, creamy emulsion. This should be well shaken before administration. The dosage is dependent upon the case. Four drams three times a day is sufficient.

Traumatisms

Wounds and injuries due to fighting and accidents are treated as in other animals. It is not advisable to paint the nests with creosote preparations as animals may become poisoned by it.

Summary

In conclusion it is repeated that raccoon farming is likely to be more pleasurable than profitable. It is well to bear in mind that the dark gray pelts, of quality, are those most in demand.

Rations should have a heavy calcium content. This is easily handled through the use of edible steamed bone meal or finely ground green bone. Pregnant or nursing females and growing young must get this calcium.

Separate the young from the dam at eight weeks of age. Young raccoons should receive solid food while still nursing.

Lastly—handle raccoons with caution, they are not as easy to handle as foxes or minks.

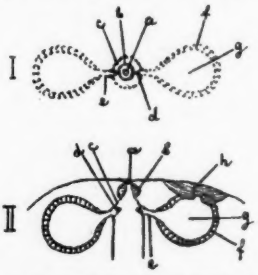
Veterinarians should familiarize themselves with the husbandry of fur bearing stock for experience has shown me that more problems have to do with husbandry methods than with disease.

DESCENTING SKUNKS

For a number of years we have been removing the scent glands of skunks by means of a simple procedure. Skunks make excellent pets, are good mousers and create interest as zoo attractions and we find this operation in increasing demand. The skunk can be disarmed at any age, but young six-weeks-old kits are nicest to handle. The skunk to be descented is put in a sack, or a sheet is thrown over it, and a subcutaneous injection of Nembutal is given, using the same dosage (per pound) as is used on dogs. After the operation 5cc of 50% glucose solution will speed up recovery from the anesthetic.

When the skunk is completely under the effects of the anesthetic, a plug of cotton is inserted into the rectum past the openings of the scent ducts. These ducts orifices, one on each side, stand out like a little muscular pillar just inside the rectal sphincter and should be grasped firmly with a small pair of artery lock forceps. An eliptical incision is next made in the rectal membrane including the orifice of the duct. Traction on the duct and blunt dissection will remove the entire scent gland through this opening. The gland will hang like a grape from the forceps. A similar operation removes the opposite gland.

If the opening made by the incision is quite large, a catgut suture may be used to close it. The cotton plug is removed and some mineral oil injected into the rectum. This operation is performed quickly and leaves no external wound.



DESCENTING SKUNKS
(From F. Mallner, 1930, "Pelztierkrankheiten.")
Explanation: a, anus; b, sphincter; c, intestinal wall; d, papilla; e, gland-duct; f, gland-muscle; g, odor gland.
I. Relative position of anus and glands.
II. Horizontal, sectional view of the glands.

The operator should wear rubber gloves and working under a sheet of glass is an added precaution. Should a gland break, or other accident occur, a 5% solution of ammonia water does a satisfactory job of deodorizing.

A method of extirpating the anal glands, in vogue in Europe, described by Mallner (1930), is carried out, preferably at the age of three to nine weeks, as follows:

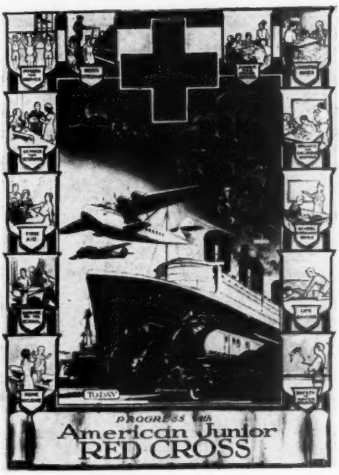
The skin over the gland is stretched; an incision about 1cm long, is made to a depth of about 5mm, the whitish gland becomes exposed and is pulled out by gentle traction. Grasping the duct with forceps, the duct is severed about 5mm from the base of the bulbous end. No after treatment is required. Healing is complete in three to four days.

E. J. FRICK,
Manhattan, Kans.

SUPPORT THE RED CROSS

In its work of aiding the victims of approximately 100 disasters a year the Red Cross is concerned primarily with human needs, but in many instances it also assists in the rescue and feeding of live stock and pets.

The most notable example of the organization's rescue and feeding of animals occurred during the Mississippi Flood in 1927, when more than $2,400,000 was expended for live stock and poultry feed in 112 counties. A large part of this sum was spent during the early days of the flood when the water covered the land and the Red Cross was caring for more than 271,000 horses, mules and other live stock.



In meeting the rehabilitation needs of the families in this disaster, the Red Cross expended more than $333,000 to purchase live stock and poultry for families who had lost their animals in the flood and who were without resources to make the necessary replacements.

When families are evacuated from their homes, as in the floods of this year, the rescue and care of their pets usually is undertaken by local animal welfare societies, but frequently these refugees bring dogs, cats, birds and other pets to the refugee centers with them. In Springfield, Massachusetts, last March, an elderly spinster succeeded in smuggling a cat out of the animal quarters in the basement of the refugee center where she was staying, to the women's sleeping quarters. No disturbance was made during the night, but in the morning the five kittens which had been born under her bed made their presence known and Tabby and her offsprings were given shelter with the other rescued pets.

The Red Cross work of giving aid to the victims of disasters and its programs of public health nursing, instruction in first aid, water life saving, home care of the sick, assistance to veterans, civilian relief and the production of garments for families in need, are all supported by the membership dues of citizens who join the Red Cross during its annual Roll Call, held each year from Armistice Day to Thanksgiving. You can share in the work of the Red Cross by enrolling in your local Chapter from November 11 to 26.

ARMY VETERINARY SERVICE

Major Forest L. Holycross is relieved from further assignment and duty at Fort Hayes, Ohio, and from additional duty at headquarters, 5th Corps Area, and the General Reserve Depot, Columbus, Ohio, effective on or about January 1, 1937, is then assigned to station at Fort McClellan, Ala., and will proceed to Washington, D. C., and report to the commanding general, Army Medical Center, for temporary duty for a period of approximately one month for the purpose of pursuing a post-graduate course of instruction at the Army Veterinary School upon completion of this duty will proceed to Fort McClellan, Ala., and report to the commanding officer for duty. Major Holycross is, in addition to his duties at Ft. McClellan, Ala., detailed as attending veterinarian, Maxwell Field, Ala.

Colonel Alfred L. Mason is relieved from further assignment and duty as station veterinarian, Presidio of San Francisco, Calif., and from additional duty at headquarters, 9th Corps Area, and will report to the commanding general Ninth Corps Area, Presidio of San Francisco, Calif., for duty with the Veterinary Corps at his headquarters, and additional duty as station veterinarian, Presidio of San Francisco.

DEATH OF MAJOR MARTIN

Major Arthur D. Martin, V.C., U. S. Army, died October 23, 1936, at Walter Reed General Hospital, Washington, D. C., after a long illness.

He was born in Orid, N. Y., November 12, 1891, and received the degree of Doctor of Veterinary Medicine from the Indiana Veterinary College in 1915. He was appointed in the Regular Army, September 4, 1917, with rank of second lieutenant, and was promoted through the grades, attaining his majority September 18, 1931.

He served at various stations in the United States and with the A.E.F. in France. He was a graduate of the Army Veterinary School, and the Medical Field Service School, and was on duty in the Panama Canal Department at the time of his illness.

Services were held in the Chapel at Walter Reed General Hospital at 10 o'clock Tuesday, October 27, 1936. Interment in Arlington National Cemetery.

He is survived by his widow and one son.

Chappel's KEN-L-BISKIT made with FRESH RAW MEAT

• A veterinarian was being shown through the Chappel Bros. plant at Rockford, Ill. He stood before the dough-mixing machine and watched, fascinated, as the various ingredients were brought up for an ordinary batch of Ken-L-Biskit dough.

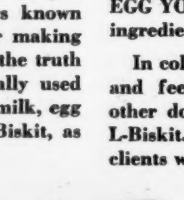
"I have an apology to make to you folks," he said. "I've always known Chappel Bros. reputation for making quality dog foods, but to tell the truth I didn't believe that you really used fresh raw meat, fresh whole milk, egg yolk, etc., in making Ken-L-Biskit, as you advertise.

"Probably I was sort of disillusioned, you might say, by the flood of cheap foods on the market, and after my experience with them, I lost faith in all prepared dog foods.

"But this visit to your plant has been a real revelation to me. I know now that the ingredients you use are every bit as fresh, clean and wholesome as the foods I eat myself!"

In every batch of Ken-L-Biskit, Chappel Bros. use FRESH RAW MEAT (not scrap or waste "meat"), FRESH WHOLE MILK (not dry skim milk), EGG YOLK and other pure, nutritious ingredients.

In color, taste, quality of ingredients and feeding RESULTS—there is no other dog biscuit like Chappel's Ken-L-Biskit. You can recommend it to your clients with confidence.



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Veterinary Reserve Corps

New acceptances.—First lieutenants—Charles Augustus Mitchel, Cheyenne, Wyo., and Frank Reed Winsor, Montgomery, Ala.

Promotions.—To Captain — Erwin Leonard Swanson, Honolulu, T. H. To First lieutenant—Carl Frederick Brenner, St. Louis, Mo.; Alfred Gustav Karlson, Ames, Iowa, and Earl S. Mohr, Connersville, Ind.

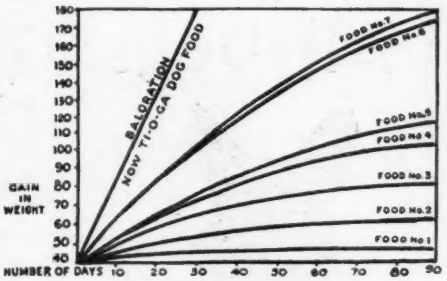
New assignments to active duty with CCC.—Capt. Arthur J. Currie, Chicago, Ill. First lieutenants—Glen O. Fly, Fort Knox, Ky.; Carlton W. Schwiesow, Chicago, Ill., and Robert V. Talcott, San Francisco, Calif.

Termination of assignment to active duty.—First lieutenants—Fred M. Sample, Tyler Dist., Tyler, Tex., and Norton A. Orr, Ft. Douglas, Utah.

DOCTOR EICHHORN HONORED

Dr. A. Eichhorn, Pearl River, N. Y., has just been notified of his election as an honorary member of Den Norske Veterinaerforening (The Veterinary Association of Norway).

Doctor Eichhorn states that he is very grateful for the honor that the Norwegian Veterinary Association has conferred upon him. The more so as Norway is one of the few countries of Europe that he has not visited.



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Growth chart above is conclusive biological proof that TI-O-GA Dog Foods have superior nutritional value. Further proof is evidenced by the raising of six successive generations of bloodhounds to robust health on an exclusive diet of TI-O-GA Dog Food. Five, four, and three generations of other breeds added to kennels at later dates have also attained healthy maturity on a diet composed exclusively of TI-O-GA Dog Food.

For these reasons you may be sure that TI-O-GA Dog and Puppy Foods merit your professional endorsement. If interested in dispensing TI-O-GA, write for details.

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The triple tested goodness of Ideal Dog Food has received the OK of dogs everywhere. Ideal is composed of seven major ingredients, scientifically balanced for appetite appeal, health, and growth. Every can is inspected and passed by Uncle Sam. Purity is positively assured by the Wilson Quality Control. Constant research and tests are conducted by the Wilson Fellowship at the University of Wisconsin.

Ideal Dog Food has proven its worth under actual feeding conditions. We invite comparison.

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The Originators of Packaged Medicines for Veterinarians

HUDSON, N. Y.

FEED GRAIN SUPPLY LESS THAN YEAR AGO

A 25% reduction in the supply of feed grains per grain-consuming animal unit for the current feeding season as compared with the supply of a year ago and with the 1928-32 average was reported in November by the Bureau of Agricultural Economics in its annual report on the outlook for feed crops and livestock.

"Shortage in present feed supplies is primarily in grain. Hay supplies are approximately normal. Supplies of by-product feeds are about average. Imports of corn are expected to be larger than those of 1934-35 when they constituted about 2.5% of the season's production of corn. Pastures probably will furnish almost normal feed supplies this fall and winter except in the Northern Great Plains region. An increase in corn and barley acreage is expected in 1937.

"The livestock-grain price ratio probably will be generally unfavorable to feeding during the coming winter and early spring, but later in the year it probably will shift so as to be favorable to feeding. If feed-grain production during the next few years is approximately average, the position of livestock producers will be more favorable than that of cash-grain farmers. It will take several years for livestock production to regain the level existing from 1930 to 1934. The outlook for dairymen, however, is somewhat less favorable than for producers of meat animals."

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Cara *Who?*

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STARCH-SPLITTING Enzymes . . . Sealed Cod Liver Oil . . . and now CAROTENE—the latest, and possibly greatest, improvement ever made in Gaines Dog Food. Carotene itself, contains no vitamins. It is a pro-vitamin—a substance that is converted into Vitamin A in the dogs' own bodies, thus toughening their mucous membranes . . . thus, building a shield against the entrance of disease germs . . . thus, as everyone admits, producing better coats—eyes—appetites—and digestion.

Since we introduced Carotene in this magazine last month, congratulatory messages have poured in from authorities on nutrition . . . sales have jumped . . . and feeders are telling us—as we told you—that CAROTENE is a real improvement in Gaines Food.

Why deprive YOUR dogs of this great protection. It's hardly fair. It's hardly good business because you get the disease-resisting values of Vitamin A—at no extra cost. So—no matter what your present opinion of Gaines Food, or of any commercial food, may be—don't shut your eyes to the forward march of nutrition . . . Use the coupon today.

GAINES MEAT AND MILK MEAL COOKED

The Granular Food

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Trial Order—One doz. boxes (once only)...$ 8.00
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Dr. .....
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IOWA VETERINARIANS MEET

The Cedar Valley Veterinary Association met at Waterloo, Ia., Oct. 12. Forty-two veterinarians attended from fourteen counties. Frank Breed, Lincoln, Neb., and R. M. Hofferd, Cedar Rapids, Ia., furnished the discourse on swine diseases. George T. Smith, Reinbeck; C. B. Strain, Dunkerton; Harry S. Lames, Dysart; C. E. Juhl, Osage, led in the discussions.—*P. V. Neuzil, Secretary.*

WISCONSIN VETERINARIANS WILL CONVENE IN JANUARY

The winter meeting of the Wisconsin Veterinary Medical Association will be held January 18-19-20, 1937, in Madison, Wisconsin.—*B. A. Beach, Secretary.*

VERMONT A MODIFIED TUBERCULOSIS FREE AREA

With the accrediting of Vermont as a modified tuberculosis-free area, by the United States Department of Agriculture on November 2, 1936, only about 100 counties in six states are left in the non-accredited area. In all the remainder of the United States and in Maine and Vermont the percentage of tuberculosis among the cattle of those areas has now been reduced to less than 0.5%.

Decidedly beneficial to dogs with DISTEMPER

"Dejem"

Reg. U. S. Pat. Off.

Controls the severe sickness following inoculations.

"Dejem" 16 oz. size, 1 bot.....$ 2.75
3 bot. .....$6.75, 6 bot.....$12.00

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Detroit Veterinary Supply Co.

460 West Jefferson Avenue, Detroit, Michigan

Canadian Branch, 139 Sandwich St., Windsor, Ontario

The Associated Serum Producers also report widespread use of their general news releases on hog cholera and other swine diseases, which are issued twice a month to the newspapers and the farm press. Regular educational programs over radio stations are to begin soon.

The educational campaign of the Producers has received the approval of the Committee on Public Relations of the American Veterinary Medical Association.

* * * *

ILLEGAL VETERINARY PRACTICE STOPPED

Upon complaints of several farmers in the vicinity of Glencoe, Minnesota, McLeod County, the Practice and Ethics Committee of the Minnesota State Veterinary Medical Society investigated the illegal veterinary practice of one Theodore F. Leuck and found that this person had practiced veterinary medicine illegally for eighteen years and had stated that he intended doing so and challenged any one to stop him. Several farmers were found who were willing to appear on the witness stand, declaring that this Theodore F. Leuck demanded a fee in money for services and also held out that he was competent to practice veterinary medicine. During the course of the hearing, at which about

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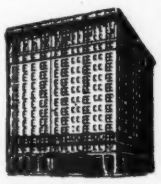

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Classified Advertisements

For Sale, Wanted, etc., $2.00 for 25 words or less; additional words, 8 cents. 25 cents extra when replies are sent in care of VETERINARY MEDICINE.

NOW READY—2nd edition Judy's Dog Encyclopedia, 464 pages; $5.00 cash or C. O. D. Dog World subscriptions, $2.00 one year; $3.00 two years. JUDY PUBLISHING COMPANY, 3323 Michigan Blvd., Chicago.

VETERINARY PRACTICES, physicians, etc., furnished; also assistants, etc. Practices handled for sale. F. V. Kniest, 1537 S. 29th St., Omaha, Nebr. Established 1904.

FINE SADDLE HORSES? Full reports of all shows? Beautiful horse pictures? Advice on his training? Complete saddle horse news for only $2.00 per year (12 beautiful magazines). The National Horseman, 512 Fourth St., Louisville, Kentucky.

FOR SALE: A mixed practice in the heart of the Imperial Valley. Dairying is one of the principal industries. Large territory, paved roads in all directions. For particulars, write: Dr. G. P. McNay, El Centro, Calif.

WANTED: A location in a Southeastern State. A veterinarian would be interested in hearing from a practitioner who wishes to sell. Address No. 154, care of VETERINARY MEDICINE.

WILL SELL, lease or share growing small animal hospital with veterinarian of five years' experience. Address: New Jersey Animal Hospital, Union, N. J.

WANTED: Veterinarian experienced in small animal practice, by an animal hospital near Chicago. Single man preferred. Address No. 152, care of VETERINARY MEDICINE.

two hundred fifty farmers from the surrounding territory put in an appearance.

On June 29th, 1936, the District Court of McLeod County made its Order permanently restraining one Theodore F. Lueck from practicing Veterinary Medicine in the State of Minnesota. The action was brought by Dr. A. C. Spannaus and Dr. E. H. Gloss, as plaintiffs. These men are both members of the Ethics Committee of the Minnesota State Veterinary Medical Society. Doctor Spannaus is the Chairman.

The Courts have generally held that a license to practice a skilled profession is a property right, and that such a property right may be protected by Injunction where there is an infringement by one who is not licensed, and one or more members of the profession may sue to restrain, in behalf of all the members of the profession.

KANSAS VETERINARY MEETING

The meeting dates of the next annual convention of the Kansas Veterinary Medical Association are January 13 and 14, 1937. The meeting will be held at Wichita.—*Chas. W. Bower, Sec'y-Treas.*

The next annual meeting of the Northwestern Illinois Veterinary Medical Association will meet at Freeport, November 23. Roy E. Kluck, of Freeport, is secretary.

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is carried in stock in all parts of the Country. Reduce your freight charges by obtaining your supply from our nearest distributor.

Information on request.

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Three large distributors assure you of 24-hour service on Fowler Serum, Pharmaceuticals, and Biologics anywhere in the Corn Belt; Dr. Paul L. Matthews, 4688 Poppleton, Omaha; Dr. Robert D. Wall, 910 28th Street, Des Moines; and L. L. John, 1018 South Lyndhurst Drive, Indianapolis.

Fowler Serum is also distributed by Armour and Company Branch Houses everywhere, thus guaranteeing you prompt service no matter where you may be located.

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Here, as everywhere else, the Government Inspector plays an important role. He sees that every step in the manufacture of the serum will be carried out with maximum care and efficiency. But Fowler goes one step farther. To supplement the Government's immunity test, a sample of each serial of serum and virus is sent to the Laboratory of Ashe Lockhart for bacteriological examination. Thus the veterinarian who uses Fowler Serum is *doubly* sure that he is using a product which is safe, uniform, and dependable.

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Leucocyte Extract may shorten the course of strangles...decrease pneumonia mortality!

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The new low price on Leucocyte Extract Squibb makes it of especial interest to veterinarians who have been anxious to secure this product for certain conditions for which no specific curative agent is at present known.

It is not claimed that Leucocyte Extract Squibb is a specific for any disease; neither is it claimed that it is a cure-all; but from reports available certain conclusions may be drawn.

In dog distemper it has been found very effective; even in late stages of the disease. It may be used alone or in conjunction with specific serums.

In strangles in horses, leucocyte extract will be found effective in shortening the course of the disease. Prompt treatment will frequently abort the disease before the affected glands suppurate and make feeding difficult.

In pneumonia and other respiratory afflictions it improves the general condition and probably shortens the course of the disease and decreases mortality.

Many cases of navel infection and pyemic arthritis respond very favorably. Infections of undeterminate origin have been found to be benefited if treatment is not too long delayed.

According to Hiss and Zinsser, "The action of leucocyte extract...is most likely chiefly due to poison-neutralizing or-destroying bodies, which act on the endotoxin." Among the poison-neutralizing bodies referred to are the leucocytes or white corpuscles.

Leucocyte Extract Squibb may help you to prevent the loss of a valuable animal attacked by some disease for which there is no known specific. Available in 20 c.c. and 100 c.c. sizes.

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Scotch terrier, age 2½ years. Extreme shedding was coupled with a skin irritation so severe that the dog had scratched himself bare in many places. Careful examination ruled out both internal and external parasites. On May 18th, 1936, the veterinarian diagnosed the trouble as resulting from *malnutrition* following *incorrect feeding*, and prescribed an exclusive diet of Swift's PARD and water. Scratching subsided . . . by June 16th, just 4 weeks later, new hair was filling in the thin and bare patches, and the dog was released in perfect condition.

Case history reported to Swift & Company

by a prominent Chicago veterinarian (name and address on request)

Independent tests are being made on PARD by a number of prominent veterinarians. These men are feeding Pard to dogs having a wide variety of disorders, caused by malnutrition following *incorrect feeding*. The dogs' symptoms have vanished, in almost every case, *after a month or less* on Pard.

At Swift & Company's kennels, Pard has been the exclusive diet of more than 100 fine dogs . . . *through 3 generations!* Not one dog has yet been lost at the Pard kennels for any reason even remotely connected with diet. Pard is the ration that outstandingly merits your trust and recommendation.

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VITA-KING is a product of Abbott Laboratories, a leader in vitamin research. This one product provides vitamins in proper balance, and other important nutritional factors such as pure barley malt extract and concentrated milk minerals. It is rigidly bio-assayed for Vitamins A, B-G, D and E.

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VITA-KING promotes growth in the young and assures better utilization of food in mature animals. It is a valuable aid in the treatment of practically all disturbances of animal health in which a nutritional deficiency is a possible cause . . . especially gastro-intestinal troubles, non-parasitic skin infections, stomatitis, rickets, respiratory infections and ophthalmic conditions. It is very useful in correcting depraved appetites. It builds better health in bitches in whelp. Much evidence exists that Vitamin E, present in VITA-KING, is effective in overcoming infertility and sterility.

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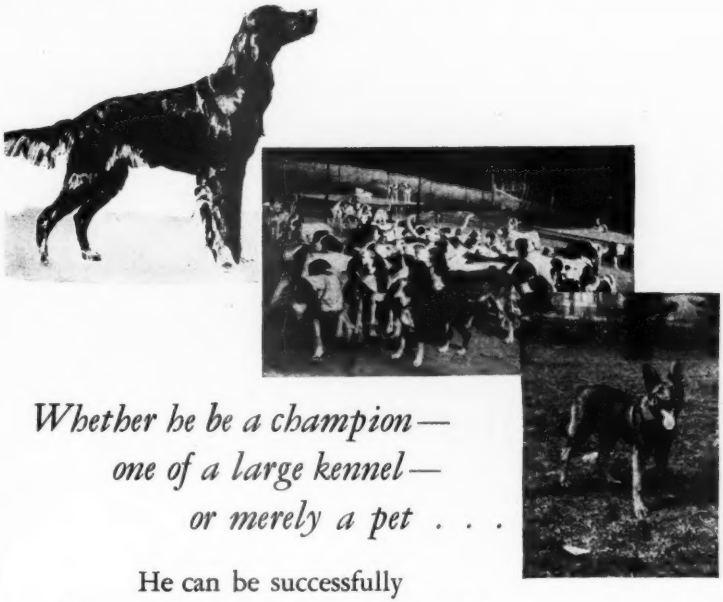

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An homologous serum (derived from dog blood) containing antibodies for both the *filtrable virus* of distemper and its *complicating organisms*. It is super-potent because it is standardized biologically and by actual tests on dogs.

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Two Syringe Package of

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IN VARIOUS infections the general defensive forces of the body are markedly stimulated by the intramuscular injection of nonspecific proteins reinforced by lipoids.

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the H-G plan of horse parasite control remained popular during the past eight years while other plans were tried and discarded.

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Dry Mass		*Liquid*	
No. 1, 6 dram, in cans of 25	$ 2.75	No. 3, 6 dram, in cans of 25	$ 2.75
100 (4-25's)	10.50	100 (4 25's)	10.50
500 (in 25's)	51.25	500 (in 25's)	51.25
1000 (in 25's)	100.00	1000 (in 25's)	100.00
In pkg. of 1 doz.	1.50	No. 4, 3 dram, in cans of 20	1.70
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100 (5 20's)	10.50		
In pkg. of 1 doz.	1.15		

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(Equine)

In cartons of 1 doz. 16-oz. cans	$ 3.50
In 5-pound cans	1.50
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Nearly 300 newspapers in major hog-producing states have already requested the series of educational articles on Animal Health which has been prepared by the Associated Serum Producers for release in connection with its 1936-37 educational and advertising campaign.

This announcement, made by the Producers' advertising committee this week, indicates that the new campaign is already meeting with widespread public acceptance, in spite of the fact that it has been under way only a little more than a month.

The series of educational articles is carried over the name of the American Foundation for Animal Health, recently set up by the Associated Serum Producers for disseminating public information. Under the title "Health Hints for Livestock", the series follows the general style used in the feature articles on human health carried in many newspapers. The articles take up such subjects as Hog Cholera, Swine Erysipelas, Swine Plague, Infectious Enteritis, Similarity of Symptoms in different livestock diseases, and kindred material. All of the articles point to the fact that the only safe course for the livestock producer lies in calling his local veterinarian whenever signs of sickness appear. Stress is laid on the danger of attempted diagnosis or treatment by any person not professionally trained.

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Horse Back To Work in Three To Five Days

It is a powerful antidote to inflammation occurring in the periosteum, articulations, bursæ, tendons, ligaments; also where there is pain, exostosis or lameness. Usually only one application is necessary. One bottle is sufficient to treat three or more cases.

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FREE Booklet—"Reminders in Diagnosing Obscure Lameness."

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Free Sample. To Every Veterinarian that has not received a sample, we will gladly send postpaid a liberal sample upon request. No obligation.

DETROIT VETERINARY SUPPLY CO.

Detroit, Michigan

Canadian Branch, Windsor, Ontario

Bang's Disease Control

The successful control of any disease is dependent upon the adoption of a method or combination of methods that are practical and economically possible.

Is the proposed eradication of Bang's disease by the slaughter method economically justifiable?

Calf-hood vaccination is apparently growing in favor and may be found to be the solution to this perplexing problem.

Vaccination of calves, heifers and negative reacting young cows, by the use of properly prepared vaccine, according to outstanding practitioners, has been a means of controlling Bang's disease in infected herds and preventing its occurrence in non-infected herds.

Giltner has said "there is sufficient evidence available on which to base the hope that vaccination against Bang's bacillus may become the chief bulwark against that pathogen."

"The injection of the living non-virulent strain of B. abortus in the form of a vaccine into cattle, both pregnant and non-pregnant, produces no harmful results. It has been conclusively determined that experimental animals can be protected against massive artificial infection for a period of years."—Huddleson.

It is a well recognized fact that blood testing is of value and by its use Bang disease free herds can be established and maintained if the testing is done at frequent intervals. "Research of the highest type in Europe had already demonstrated that both vaccination and blood testing are necessary in the control of this formidable disease."

WHY NOT FACE REALITIES?

According to the reports of numerous practitioners, the losses due to Bang's disease are being reduced to a minimum by the use of Kinsley's Abortion Vaccine, and proper herd management.

KINSLEY LABORATORIES

1103 East 47th Street *Telephone Lo-4600 Kansas City, Mo.*

Announcing

PULMONARY MIXED BACTERIN

Lederle

A NEW PRODUCT for the prophylaxis and treatment of pulmonary infections of cattle and swine.

The annual losses recorded from the complicated pulmonary involvement of cattle and swine (as, for example, so frequently found in hemorrhagic septicemia) have prompted the manufacture of this vaccine.

in 50 and 250 cc. packages

BOVINE PULMONARY MIXED BACTERIN *Lederle*
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BOVINE INFECTIOUS ABORTION

From a non-virulent culture as supplied by the U. S. Bureau of Animal Industry, a new vaccine has been developed. The effectiveness of this new vaccine on calves four to six months of age as reported by the U. S. Bureau of Animal Industry after investigation indicates that

a. Calves so vaccinated are resistant to future exposure and infections.

b. Calves vaccinated at four to six months of age lose their agglutinins by the time they reach the production age.

c. Calves so vaccinated do not harbor the infection or become spreaders.

d. The percentage of abortions and economic loss is reduced to a minimum.

The possibility of building a negative herd from the young stock has become a reality and the difficulties and high price of securing replacements are greatly reduced.

BOVINE ABORTION VACCINE *Lederle*

Prepared with Culture No. 19 furnished by the Bureau of Animal Industry employing the method of COTTON and BUCK.

Packages: 20 cc. (1 immunization)
100 cc. (5 immunizations)

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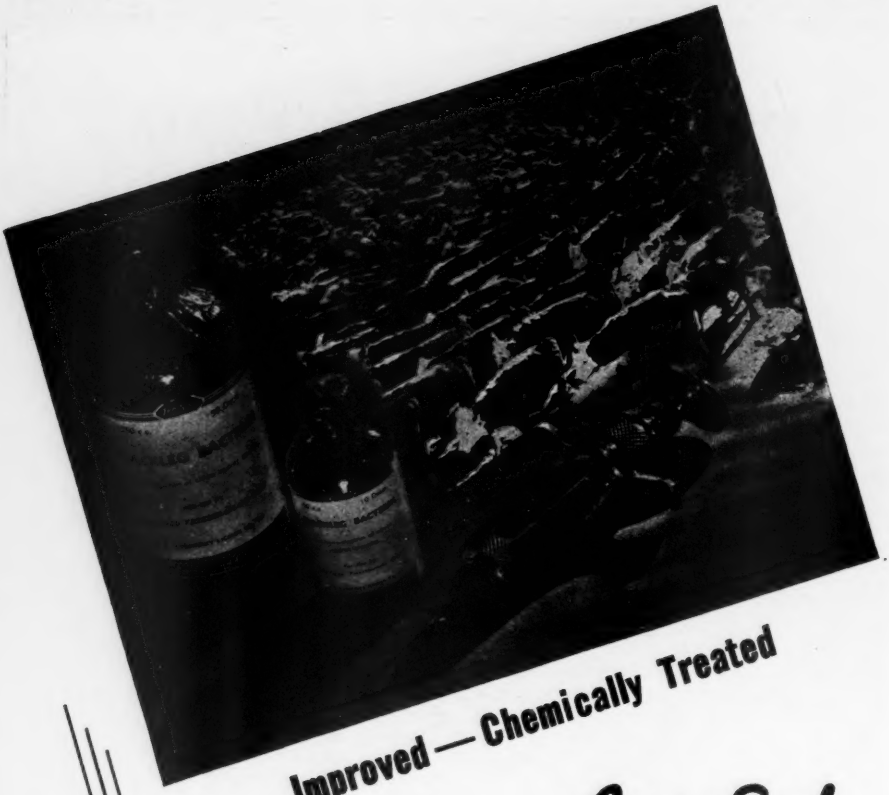

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JENSEN-SALSBERY LABORATORIES, INC., KANSAS CITY, MO.

CALFHOOD VACCINATION

against Bang's disease

is sound procedure. The work of Drs. Cotton, Buck, Smith and others, as well as field experience, proves that vaccination with present day living culture vaccine while calves are between the ages of four and eight months results in producing a high degree of resistance to infection.

Calves so vaccinated are found to be negative to blood tests when they reach breeding age, and it has been shown that they possess practical immunity to infection through several periods of pregnancy.

In valuable infected herds, calfhood vaccination offers a practical means of eliminating infection from the herd. If all calves in infected herds are vaccinated when between the ages of four and eight months, the final result is a herd free from infection and resistant to infection.

By use of the agglutination test and segregating or disposing of infected animals, the time required for establishing a Bang's disease-free, resistant herd is greatly shortened. Calfhood vaccination should go hand in hand with agglutination testing in the control of Bang's disease.

Ashe Lockhart, Inc.

"Producers of Better Biologicals for Graduate Veterinarians"

800 WOODSWETHER ROAD KANSAS CITY, MO.

AN INTERESTING DEVELOPMENT in the veterinary service of this country is the educational program sponsored by the producers of anti-hog-cholera serum and virus under the name of American Foundation for Animal Health which calls public attention to the importance of employing the local veterinarian when illness occurs among domestic animals.

The program includes a widely circulated booklet entitled "Health Hints for Livestock," news releases, radio broadcasts and other media designed for general edification on the futility of attempting to overcome the ravages of contagions unaided by professionally qualified persons.

The project has received the approval of the publicity committees of a number of veterinary associations, it has been endorsed by approximately three hundred farm papers and newspapers and, although but a few months old, it has been widely accepted among the various interests concerned.

The new campaign in behalf of veterinary medicine underwrites the logical principle that only the capable veterinarian can unravel, to the advantage of animal production, the confusing syndromes of livestock diseases of which the interlocking swine plagues are examples.

★ ★ ★

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